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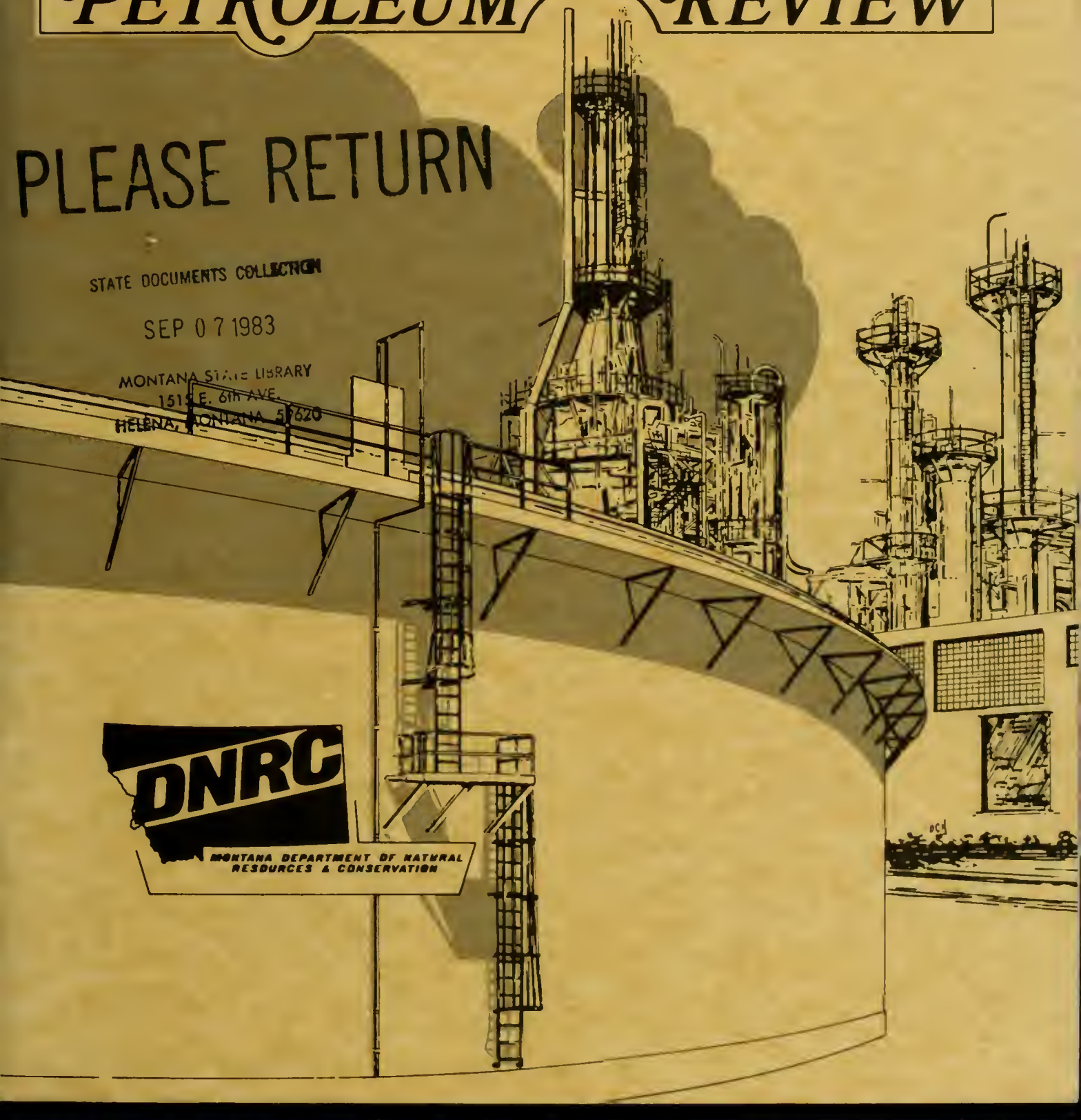

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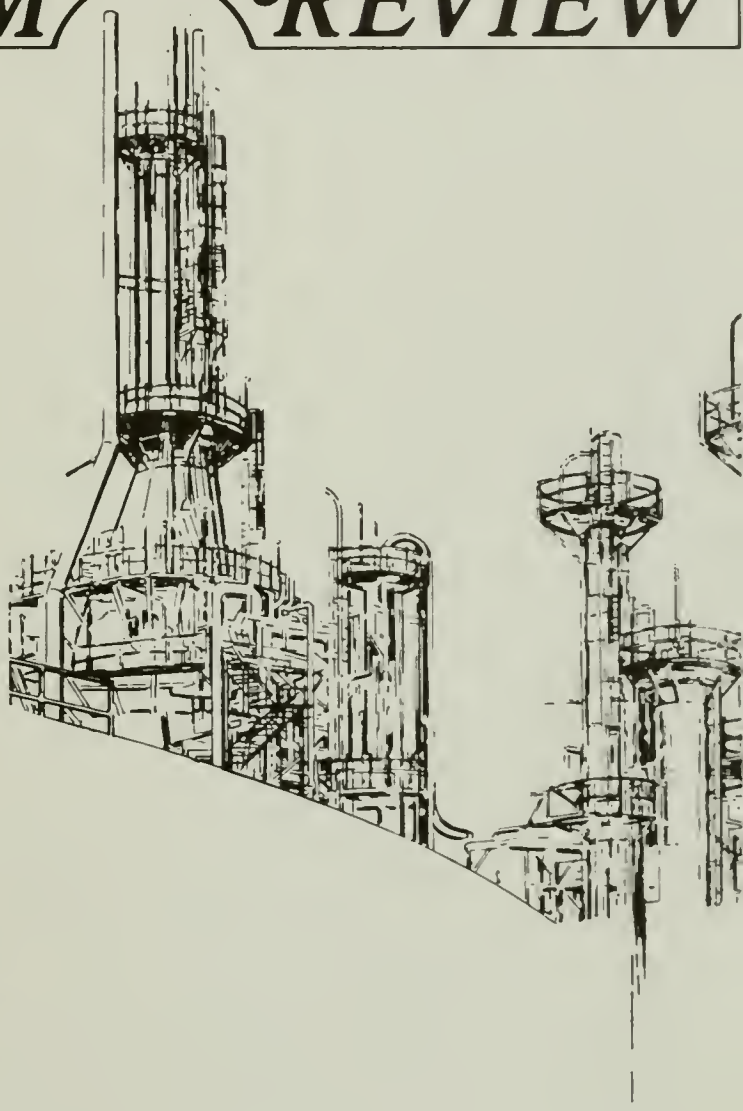

Prepared by
Natalie Walsh

Energy Division

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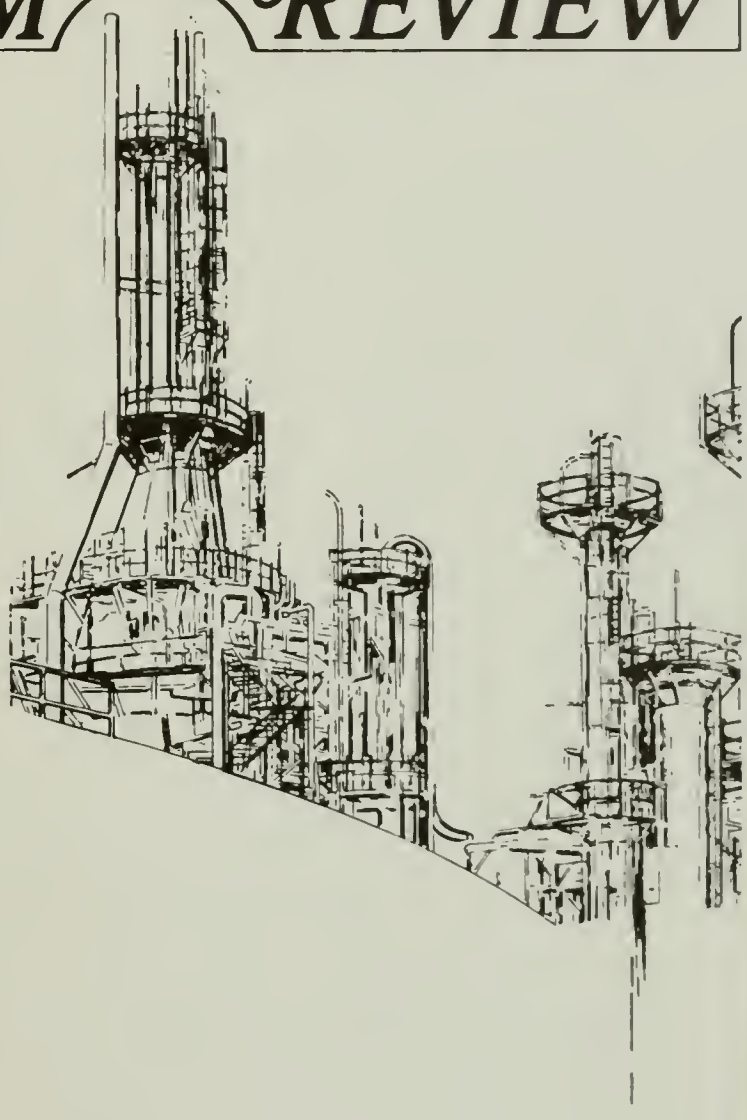

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RESOURCES AND CONSERVATION

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ABBREVIATIONS

AGA	American Gas Association
API	American Petroleum Institute
b/d	barrels per day
bcf	billion cubic feet
Btu	British thermal units
DNRC	Department of Natural Resources and Conservation
DOE	U.S. Department of Energy
EECA	Emergency Energy Conservation Act
EEPA	Energy Emergency Preparedness Act
EIA	Energy Information Administration
EPAA	Emergency Petroleum Allocation Act
FERC	Federal Energy Regulatory Commission
LPG	Liquified Petroleum Gas
mcf	thousand cubic feet
MDU	Montana-Dakota Utilities
mmcf	million cubic feet
MPC	Montana Power Company
Mw	megawatts
NGA	Natural Gas Act
NGL	Natural Gas Liquids
NGPA	Natural Gas Policy Act
NOJC	National Oil Jobbers Council
PSC	Public Service Commission
SIC	Standard Industrial Code
tcf	trillion cubic feet
USGS	U.S. Geological Survey

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INTRODUCTION

In combination, petroleum products and natural gas satisfy nearly 75 percent of Montana's energy requirements. While supplies of these resources are currently adequate, market shortages of both fuels occurred in the past decade. Periodic supply shortfalls, combined with a trend toward allowing fossil fuels to be priced according to their market value rather than by government regulation, have caused energy prices to escalate sharply in recent years.

As a framework for understanding the status of these energy resources in Montana, this report analyzes the structure and operations of the oil and gas industry in the state relative to market trends and the major regulations that govern these markets. The report presents a general overview of the state's oil and gas production, transporation, and marketing operations, and is intended as a basic informational reference as well as a foundation for understanding such issues as government deregulation and the vulnerability of the state to energy supply disruptions.

NATURAL GAS

I. Overview

The market shortages of natural gas that developed across the country during the mid-1970s provoked widespread concern that the United States faced an imminent crisis in natural gas supply. Consumer demand for this comparatively inexpensive, clean-burning fuel had increased dramatically throughout the 1960s. The country's dependence on natural gas continued to grow into the 1970s, but domestic gas reserves, which peaked in 1967, began to plummet, as new gas discoveries failed to replace annual production.

In contrast to the pessimistic supply outlook of just a few years ago, utilities are expressing confidence in the future of natural gas by encouraging residential users to switch from electricity or fuel oil to natural gas for home heating. According to the national reserve data depicted in Figure 1 on page 3 , this reversal does not stem from any significant improvement in the resource base. Instead, the improved market outlook is due to changes in the federal regulatory structure and reflects the fact that sharply increased gas prices have substantially reduced current consumer demand. In addition, federal curtailment policies prompted industrial users, the sector with the highest gas requirements, to install alternative fuel systems.

In retrospect, federal regulation of the wellhead price of gas sold to interstate pipelines appears to have been a major factor causing the natural gas shortage of the mid-1970s. The federal price ceilings kept consumer costs low, but cheap gas encouraged consumption at the same time it offered the industry little incentive to find new reserves. Moreover, the regulatory structure contributed to market disparities and inequitable access to gas supply by perpetrating a dual market system—a highly regulated interstate market, and an intrastate market that was free of wellhead price controls.

In an attempt to end the dual market structure and stimulate the gas industry to find and develop new gas reserves, Congress extended wellhead price controls to the intrastate market and began to phaseout the controls on new gas. The legislative solution to the shortages, the Natural Gas Policy Act (NGPA) of 1978 keeps a lid on the price of gas from wells in production prior to 1977 (old gas), but specifies a formula for increasing the price of new gas each month until January 1, 1985, when the controls on new gas will expire.

The NGPA has resolved the earlier shortages; however, changed market conditions and problems in the practical application of the complex law may prompt Congress to modify the statute before the 1985 decontrol date. Despite a severe recession and a market surplus, natural gas prices are continuing to climb because of the price escalation formula prescribed in the law. Nonetheless, the predesignated price increases may not be sufficient to prevent new gas prices from rising abruptly upon decontrol to match the price of competing fuels. To compound this problem, many wellhead contracts specify purchase obligations or prepayment penalties that, with reduced demand, further inflate the cost of gas delivered to the consumer.

If the NGPA is rewritten, the decontrol of old gas will be a focus of the legislative debate. The Reagan administration is committed to free market policies and advocates complete market deregulation, since natural gas is the only energy source still subject to extensive price controls on production. This issue promises to be extremely controversial, because full decontrol would allow old gas, now selling for less than $1 per thousand cubic feet (mcf) to increase to the market value of $4 to $5 per mcf.

President Reagan deferred the administration's decontrol legislation until after the 1982 elections. In the meantime, the presidentially appointed Federal Energy Regulatory Commission (FERC), the agency charged with implementing the NGPA, is studying mechanisms to raise the price of old gas and to resolve contractual problems through administrative rulemaking.

The issue of market deregulation of natural gas will be decided at the federal level; the state's role is to provide information and analysis pertinent to Montana for informed decision-making. To serve that function, this review of trends in Montana's oil and gas production, disposition, supply, and consumption includes a section on the federal regulatory structure for natural gas with reference to Montana's particular situation and concerns.

II. Montana's Natural Gas Resource

RESERVES

In contrast to national trends, Montana's proved reserves of natural gas stabilized during the 1970s and grew substantially during 1980.[1,2] With an estimated 1.3 trillion cubic feet (tcf) of reserves by the end of 1981, Montana contributes less than 1 percent to the country's total known reserves of 202 tcf.[2] Montana ranks fourteenth in reserves among the thirty-five gas producing states, and is not considered a major gas producer; however, the state's geological potential indicates that this relative reserve position could improve in future years.

Only gas that is already discovered and is expected to be recovered under current economic and operating conditions is counted in the proved reserve estimates. Therefore, the national and state data shown in Figure 1 represent the most conservative measure of the potential resource base. For Montana, the reserve estimates reflect the anticipated yield from the state's producing or shut-in gas fields, most of which are located in shallow sedimentary basins along the hi-line and in the south central and eastern parts of the state. Not considered are the potential gas fields that may be discovered in the relatively unexplored complex mountain geology of western Montana and in the state's deep geological formations.

The U.S. Geological Survey (USGS) calculates undiscovered reserves for each geologic basin or province in the United States.[3] While the data are not reported by state, Montana's potential gas resource can be approximated by factorizing the reserve estimates using the ratio of the Montana portion of the basin to the entire basin area.[4] In Table 1 the areal percentage of each of the seven basins located in Montana is used as a base for dividing the gas resource of the associated basin.

This calculation indicates that there is an 80 percent probability that 3.3 tcf of additional natural gas reserves may be discovered and an outside chance, 5 percent probability, that the state's conventional gas resource will exceed 32.4 tcf. As a measure of the uncertainty involved in estimating the potential resource, the mean estimate of Montana's undiscovered gas reserves, 14.8 tcf, has a standard deviation of 9.0 tcf.

The USGS data suggest that, while the Montana portion of the Overthrust Belt has the greatest potential, the estimated reserves are also the most speculative. (The Overthrust Belt, extending from Alaska to Central America, formed when layers of the earth's crust pushed up over other layers, trapping gas and oil-bearing sedimentary deposits.) Whereas the thrust belt of Wyoming, Utah, and Alberta is yielding substantial quantities of gas and some oil, the Montana portion of the overthrust is largely unexplored.

If 14.8 tcf of additional gas reserves are actually discovered, in addition to the already proven reserves, Montana would be able to maintain current production of about 50 billion cubic feet (bcf) a year for another 322 years. Such a resource base, if committed to Montana's utilities, would satisfy instate gas requirements well into the future. This volume, however, represents only about nine months of supply for the nation.

TABLE 1
MONTANA'S UNDISCOVERED RECOVERABLE CONVENTIONAL RESOURCES OF NATURAL GAS

Basin	Area in Montana (percent)	Estimated Resource Potential (trillion cubic feet) Low (p = .95)	High (p = .05)	Mean $\bar{x}$	Standard Deviation
Montana Overthrust	100	1.8	25	9.3	8.7
Sweetgrass Arch/Bearpaw Uplift	100	.6	6.9	2.8	2.2
Southwest Montana	100	0	1.6	.4	.7
Big Snowy Uplift	100	.1	1.8	.6	.6
Williston Basin	18	.2	1.4	.6	.4
Big Horn Basin	13	.1	.7	.3	.2
Powder River Basin	31	.3	1.7	.8	.5
STATE TOTAL				**14.8**	**9.0**

Source: U.S. Geological Survey, 1982.

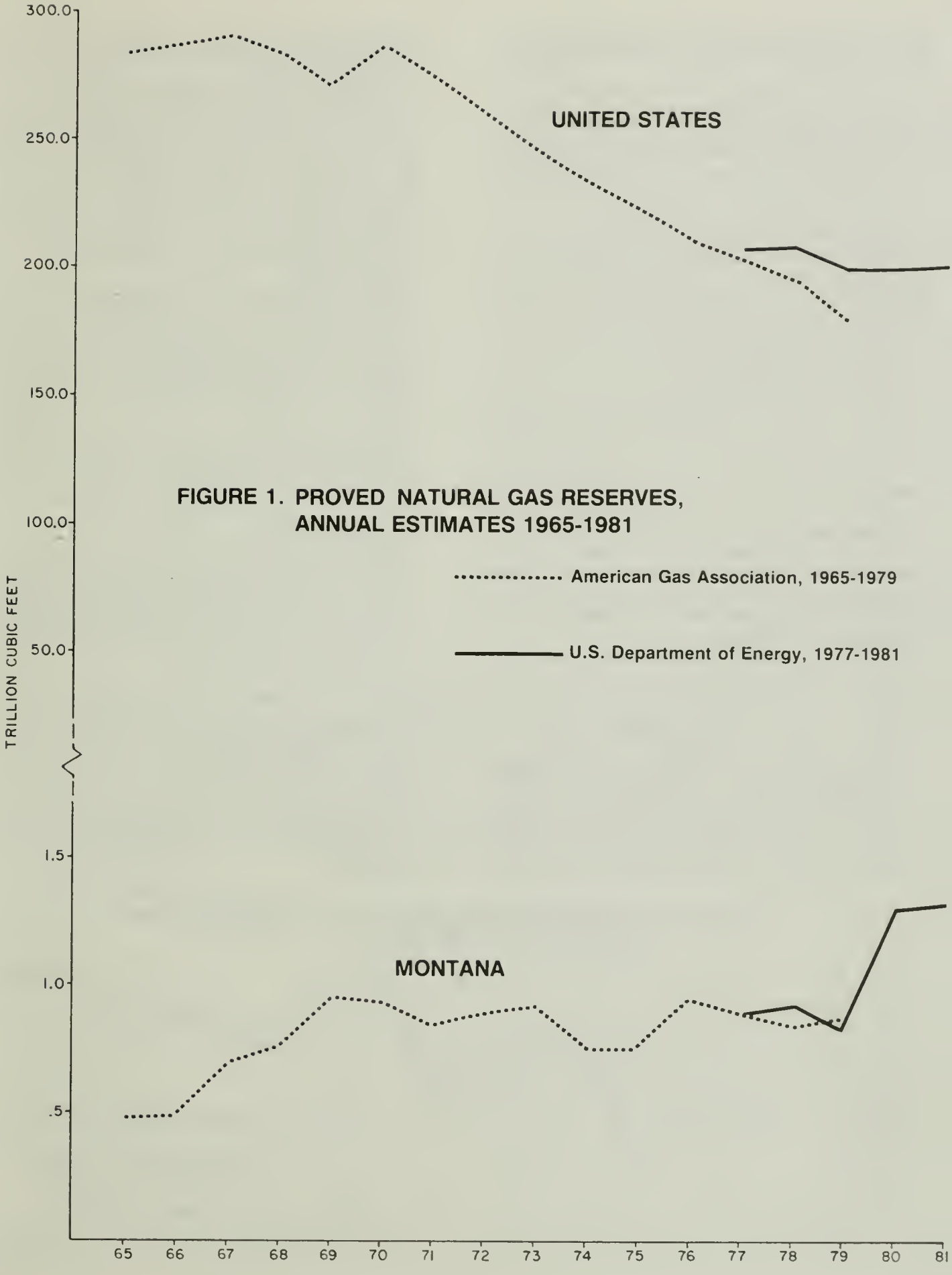


FIGURE 1. PROVED NATURAL GAS RESERVES, ANNUAL ESTIMATES 1965-1981

EXPLORATION AND DEVELOPMENT

Natural gas exploration parallels the search for crude oil since leasing, geophysical study, and drilling are analogous activities for the gaseous and liquid hydrocarbons. Because of this overlap, trends in the exploration and development of Montana's natural gas resource are discussed in conjunction with crude oil and with reference to overall industry trends.

The phased-in decontrol of wellhead gas prices and President Reagan's deregulation of the domestic oil market stimulated oil and gas exploration to record levels during 1981. In Montana, exploration activity was further enhanced by the heavy influx of Canadian drilling rigs from Alberta when the petroleum industry objected to Ottawa's energy policies.

In all, Montana's oil and gas producers drilled 1,149 exploratory and development wells in 1981, a 21 percent increase over the number drilled in 1980 and more wells than in any previous year.[5] Discovering five new gas fields, operators completed a total of 218 producing gas wells.

Interest is growing in the Montana portion of the Overthrust Belt, because of its extensive hydrocarbon potential. Exploration activity has increased, numerous seismic surveys have been conducted or are underway, and promising areas have either been leased or have applications pending. Although only a limited number of exploratory wells have penetrated the deep formations of the overthrust, several gas fields have been tapped along the northeast edge of the belt. For the most part, operators are withholding data on the results of their explorations, but the limited information available is provoking considerable speculation.

Marked by a high rate of drilling success, particularly in the Williston Basin, oil and gas exploration and development in eastern Montana increased dramatically over the past several years. In the second half of 1981, however, leasing activity there began to decline as producers focused on putting known discoveries into production, rather than investing in the expensive search for new properties.

The amount of acreage leased for mineral exploration is continually changing as old leases expire and new areas are offered for development. Leasing trends are difficult to quantify precisely, since no state or federal agency maintains records of leaseholds on private lands. Based on the amount of acreage leased on public lands in Montana,[6,7] and industry estimates of private transactions,[8] approximately 60 to 65 percent of the state's 94 million acres is presently leased for oil and gas development.

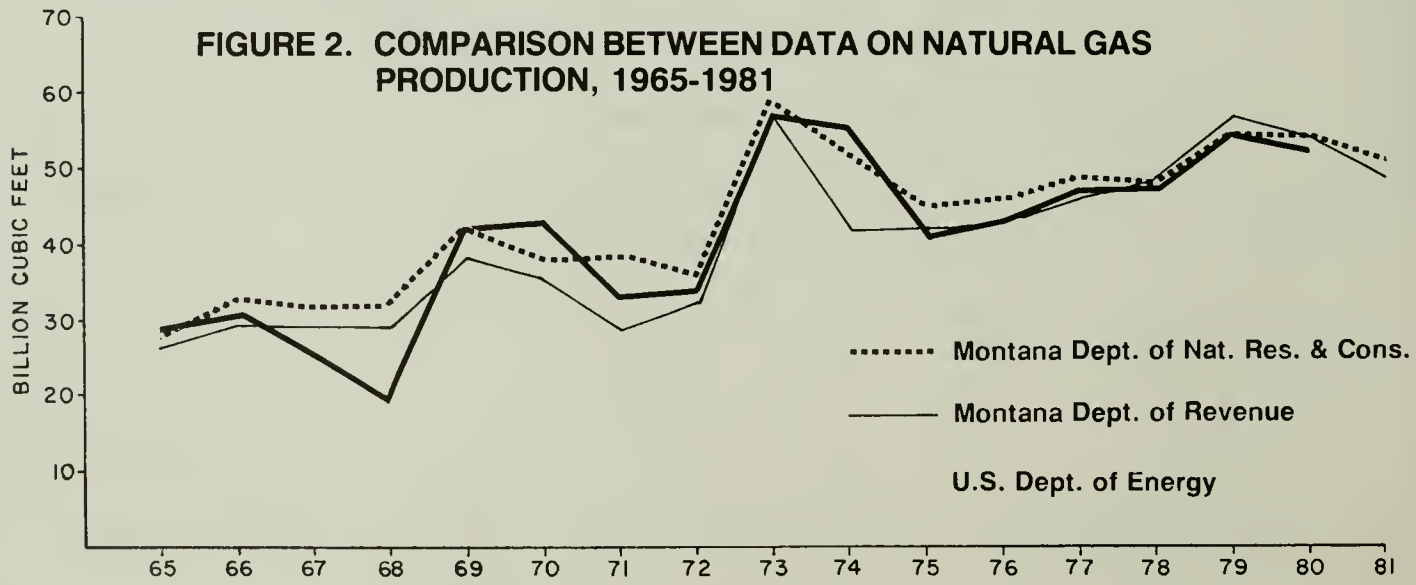
Many mineral leases were purchased with the expectation that the price of oil would continue to increase. Now oil companies are reevaluating their exploration programs in view of the recent decline in oil prices. The lower than anticipated price of oil has created cash flow problems, particularly among companies that have borrowed heavily against future income. Consequently, 1982 has been a period of readjustment with most companies reviewing their positions, especially with regard to exploration risk and capital requirements.

PRODUCTION

As a result of the exploration boom in 1981, the number of producing gas wells in Montana increased by 14 percent to total 2,142 active wells at the end of the year. Despite this development of the resource base, the state's gas production decreased 7 percent, from 53.8 bcf in 1980 to 50.1 bcf in 1981.[5]

Annual gas production trends for the period 1965 to 1981 are shown in Figure 2, comparing data from the Montana Departments of Natural Resources and Conservation,[5] and Revenue,[9] and the U.S. Department of Energy.[10] There are differences in reporting procedures and in the way gas that is vented or reinjected into the well for repressuring is measured; therefore, the data from the various sources are not consistent or directly comparable.

FIGURE 2. COMPARISON BETWEEN DATA ON NATURAL GAS PRODUCTION, 1965-1981



The federal reports provide data on both gross withdrawals and marketed production, with the latter adjusted for volumes vented or reinjected. Through 1975, the U.S. Bureau of Mines compiled these data from voluntary industry reports. Subsequently, the Federal Energy Administration and the U.S. Department of Energy (DOE) obtained the production statistics from the Montana Department of Natural Resources and Conservation (DNRC). DNRC publishes data on marketed production based on monthly reports filed by gas producers. Although the federal agencies correctly list the DNRC figures as marketed production in 1978 and 1979, the state's data are characterized as gross withdrawals for the years 1975-77 and 1980. The Montana Department of Revenue data are derived from producer tax reports on wellhead gas sales. These data should approximate marketed production, but the sales volumes are not necessarily reported at a uniform pressure.

Despite ambiguity in the data, significant production trends can be seen. An overall production increase is apparent, although annual production fluctuates between 20 and 60 bcf during the period. The production surge in 1969 corresponds to the discovery of the Bell Creek oil field in the Powder River Basin, which initially produced large quantities of associated gas. Marketed production from this field jumped from .6 bcf in 1968 to 9.2 bcf in 1969, then dropped to .8 bcf by 1972. The state's gas production increased again in 1973 following the construction of pipeline facilities to the Tiger Ridge field in north central Montana. Production from that field, which totalled 28.4 bcf in 1973, declined to 11.7 bcf by 1981.

NATURAL GAS PROCESSING PLANTS

At the wellhead, natural gas varies in chemical composition and in pressure. In addition to methane, natural gas contains differing amounts of water vapor, sulfur, carbon dioxide, nitrogen, ethane, propane, and naptha. In some fields, particularly where natural gas is found in association with crude oil (as in the Cut Bank area and in the Williston Basin), the gas contains as much as 10 to 15 percent naptha or natural gasoline.[11] This "wet" gas requires a processing plant to separate the liquid hydrocarbons to yield pipeline quality gas. Gas containing sulfur ("sour" gas) requires a conditioning plant to extract the nonhydrocarbon contaminants. In addition, compressor stations are often needed at the wellhead and along the pipeline to raise and keep the gas at the required pressure.

Although only 7 percent of Montana's gas reserves are associated with crude oil compared to nearly 20 percent nationally,[1] nine natural gas processing plants are currently in operation in Montana. The capacity of these plants and their average 1981 production are listed in Table 2.[12] Whereas propane and butane may be marketed directly from these facilities, the liquid products are shipped to more sophisticated fractionating plants or to refineries in Montana and North Dakota for further processing into finished fuels.

TABLE 2
CAPACITY AND AVERAGE PRODUCTION OF NATURAL GAS PROCESSING PLANTS IN MONTANA, 1981

Gas Plant (County)	mmcf/day Plant Capacity	mmcf/day Gas Processed	Process Method*	Production (1000 gallons/day) Propane	Butane	LPG Mix	NGL Mix
Damson Oil Corporation (Richland County)	3.0	1.0	R				4.5
Ecological Engineering Systems, Inc. (Fallon County)	2.5	1.8	R	5.2			6.0
Flying J Inc. (Glacier County)	30.0	20.5	A	7.1	7.9		6.4
MGPC, Inc. (Richland County)	3.0	2.0	R			10.0	
Perry Gas Products, Inc. (Richland County)	1.2	1.0	R	2.4			5.2
Shell Oil Company (Fallon County)	1.9	1.9	R				5.3
(Wibaux County)	1.2	1.2	R				4.8
(Richland County)	12.0	5.0	R	13.1			12.4
True Oil Company (Richland County)	4.0	1.1	R				6.7
TOTAL	**58.8**	**35.5**		**27.8**	**7.9**	**10.0**	**51.3**

*R - Refrigeration
A - Absorption

Source: Oil and Gas Journal. July 1982.

DISPOSITION

Several hundred corporations, including integrated oil companies, independent producers, interstate pipeline companies, and Montana's utilities, participate in the exploration and production of the state's natural gas. By comparison, only a limited number of firms—the utilities and the pipelines—purchase, distribute, and market the gas produced.

Aside from the gas that the utilities and pipelines own and produce directly, the disposition of Montana's gas production is determined by contract agreements negotiated between the producers and gas distributors. These contracts usually involve an extended commitment, typically for 20 years, to purchase gas throughout the life of the producing property. Such a long-term agreement ensures that the investment in wellhead compression or conditioning facilities and in the gathering line, which connects the well to the distributor's transmission system, is secured by a guarantee of continued supply.

When new gas discoveries are offered for sale through competitive bid, the prospective buyer must weigh the expense of building new pipeline facilities against the expected value and volume of the recoverable reserves. Because natural gas pipeline companies are purchasers, not simply transporters (i.e., they are not common carriers), gas transportation requirements are of particular concern to those distributors who do not have an established pipeline system in Montana. While intercompany pipeline transfers are relatively common, such transactions are voluntary and subject to negotiation.

Consequently, the disposition of Montana's gas production is largely determined by the location and ownership of the 5,700 miles of pipeline that make up the state's natural gas gathering and transmission system. This transportation system is primarily owned and operated by Montana's two major utility corporations, Montana Power Company (MPC) and Montana-Dakota Utilities (MDU), and approximately two-thirds of the 50 bcf of gas produced in 1981 was retained for instate consumption.[5]

Montana's pipeline system is part of an interstate/international gas distribution network, and is linked to Wyoming, North and South Dakota, and Canada. Through this network, but using diverse routes, two interstate pipeline companies delivered the balance of the state's production, about 16 bcf, to midwest utilities. Northern Natural Gas Company, the largest exporter, ships gas north from north central Montana through its own system to the Trans-Canada Pipeline for delivery to Minnesota. Montana-Dakota Utilities transfers 4 to 5 bcf a year through Wyoming for the Kansas-Nebraska Natural Gas Company.[13]

According to data collected by the Department of Energy,[2,13] approximately half of Montana's proven gas reserves are committed to MPC and MDU. About 30 percent of the state's reserves are dedicated to Northern Natural Gas Company and Kansas-Nebraska Natural Gas Company; the balance is either not presently under contract or the commitment status is not reported.

The long-term nature of gas purchase contracts generally precludes abrupt changes in the disposition of Montana's gas reserves. It should be noted, however, that several interstate pipeline companies, including Colorado Interstate Gas Company, United Gas Pipeline Company of Houston, and the Natural Gas Pipeline Company based in Chicago, are negotiating contracts and transportation agreements for recently discovered Montana reserves. Consequently, in the next few years a greater proportion of the state's gas production is likely to be committed to interstate markets for resale to midwest and southern utilities.

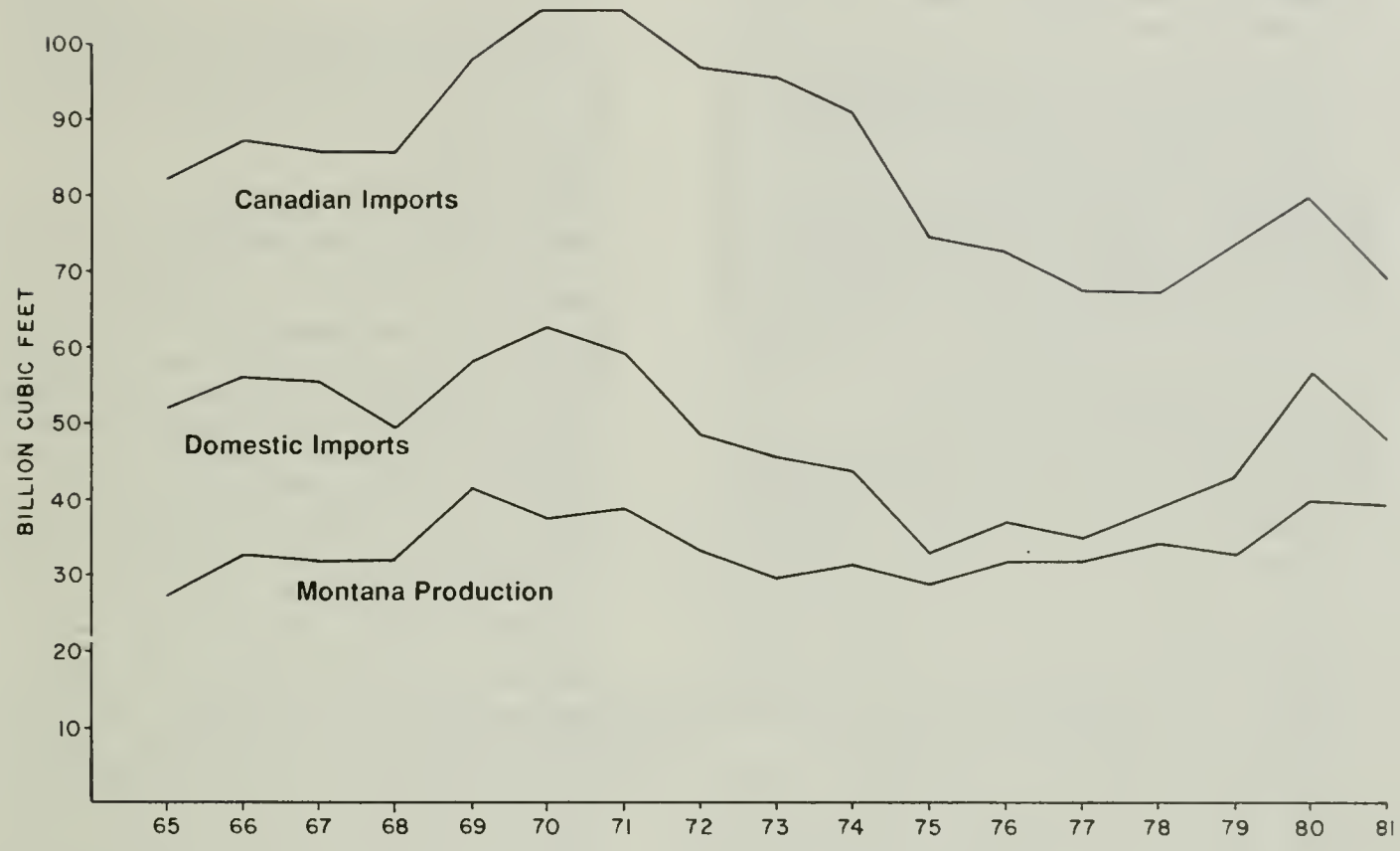
III. Montana's Natural Gas Supply

GENERAL TRENDS

Since the 1950s Montana utilities have relied on natural gas supplies from Canada, Wyoming, and North Dakota to augment their instate sources. In 1981, imports of 30.4 bcf supplemented 38.4 bcf of Montana-produced gas to total nearly 69 bcf of natural gas supply available to Montana's utilities.[5] Since the utilities injected about 17 bcf of this volume into their storage reserves, the state consumed only 52 bcf of this volume in 1981.

Montana's dependence on outside sources of natural gas culminated in the early 1970s when imports of 67 bcf made up nearly two-thirds of the state's total gas supply. Since that time, the state's gas requirements declined substantially because of price-induced conservation, fuel switching, and industrial plant closures. Net flow of domestic and Canadian gas into Montana, shown in Figure 3, dropped steadily throughout the decade until 1979. In that year, the volume of imports increased as the utilities began to restock the storage reserves that they had used to offset supply shortfalls during the period from 1975 through 1978. Except for the rebuilding of these reserves, Montana's net import of natural gas would have been negligible in 1981 for the first time in 30 years.

FIGURE 3. NATURAL GAS SUPPLY, 1965-1981



DISTRIBUTION BY UTILITIES

The Montana Power Company and Montana-Dakota Utilities, the state's two major utility corporations, manage the distribution of nearly all of the natural gas marketed in Montana. The MPC provides about 60 percent of total natural gas sales directly to the western two-thirds of the state, with an additional 10 percent of total sales distributed through other utilities. Serving Montana east of Billings, MDU supplies about 30 percent of the state's total gas requirements. Because MPC and MDU's gas supply and distribution systems are distinct, the two utilities are discussed separately in this section. A summary of the operations of the state's smaller gas distributors follows this discussion.

Montana Power Company

The Montana Power Company was originally an electric utility, but established itself as a major producer and distributor of natural gas following the purchase of the Cut Bank field in 1931.[14] Montana Power had an initial contract to supply large volumes of natural gas to fuel the energy intensive smelting operations of the Anaconda Copper Company. It then developed an expanded pipeline system to serve residential and other customers in western and southern Montana.

MPC relied exclusively on instate production to meet its gas requirements until the outbreak of the Korean War in 1950. At that time, the U.S. Department of Defense became concerned over the availability of natural gas supplies for the Anaconda Copper Company, because the Montana smelters produced a significant portion of the nation's copper, zinc, and manganese. Through the intervention of the Department of Defense, MPC purchased 400 bcf of reserves in the Aden area of southeast Alberta and obtained a permit to export 10 bcf of gas a year.

With the addition of the Carway fields in 1960, MPC's imports from Canada gradually increased until 1973, when Canadian imports peaked at an annual total of 50 bcf and made up over 85 percent of the utility's gas supply. In that year, the Arab oil embargo prompted Canada to reevaluate its gas export policy in reference to projections of its own future requirements. Based on this study, the National Energy Board began to restrict the overall volume of exports and to limit the term of export licenses to a single year, instead of the usual 10 to 15 years previously granted.

As a result of this change in policy, MPC was authorized to import gas on a year to year basis from 1974 to 1977, with the annual volume cut back to 34 bcf in 1976. By the winter of 1975-76, the reduced availability and

uncertainty of Canadian sources threatened MPC with a potentially serious supply shortfall.[15] While decreasing supply, Canada dramatically increased the border price of the exported gas, from $.33 per mcf in mid-1974 up to $1.60 per mcf by early 1976. The price spiral, coupled with the ongoing supply uncertainty, restrained consumer demand, especially in the industrial sector.

Since the price of Canadian gas was tied to the price of OPEC oil, MPC's industrial customers began to switch to the cheaper alternative fuels, electricity and coal. Moreover, increased gas costs provided an incentive for all consumers to maximize their conservation efforts. As a result, MPC's supply outlook was considerably improved by 1978, when the future of Canadian exports seemed more secure, and MPC's authorized import volumes stabilized at 34 bcf a year.

In contrast to the supply uncertainty and shortages of the mid-1970s, MPC is currently trying to resolve a supply problem of the opposite nature—a growing surplus in a declining market. With a significant cutback in its customers' requirements due to price-induced conservation, the closure of the Anaconda smelter, and industrial fuel switching to coal, MPC's gas supply greatly exceeds demand. This situation is cause for concern, because take-or-pay provisions in the utility's long-term Canadian contracts obligate MPC to pay for a specified volume of gas, even if the gas is not needed.

To correct this oversupply problem, MPC is negotiating the sale of excess Canadian gas to Tenneco, an energy corporation with plans to market the gas to eastern states. The sale has gained the approval of the Canadian National Energy Board, but the U.S. Federal Energy Regulatory Commission (FERC) has not yet authorized the transaction.

If a sale is consummated, MPC intends to rely on domestic production to a greater extent and proportionately decrease its dependence on Canadian sources. In 1981, Canadian imports of 20.8 bcf made up about half of MPC's total supply of 40.3 bcf.[16] Production from the company's 225 bcf of Montana reserves[17] furnished the balance of the utility's supply mix.

Montana-Dakota Utilities

Like MPC, Montana-Dakota Utilities started out as an electric utility. It expanded its operations into natural gas in 1951 with the purchase of the Billings Gas Company. Headquartered in Bismarck, North Dakota, MDU produces and markets gas in Montana, Wyoming, and North and South Dakota.

In 1981, 15.5 bcf of Montana-produced gas comprised about 20 percent of MDU's total system supply of 78.7 bcf.[18] Wyoming gas made up about 40 percent of the supply base; the Dakotas, primarily North Dakota, contributed the rest.

The Montana segment of MDU's interstate pipeline system provides a transmission intertie linking Wyoming and North and South Dakota. Substantial volumes of gas move through the state, and the outflow of Montana production is displaced by shipments from Wyoming and North Dakota.

On a net basis within the MDU system, more gas is imported into Montana than exported. The data depicted in Figure 3[5] indicate that net imports of gas into the state from Wyoming and North Dakota decreased sharply during the early 1970s, dropping from 24.7 bcf in 1970 to 3.2 bcf in 1977. Interstate imports have subsequently increased, because MDU is injecting large quantities of gas into its storage field near Baker in eastern Montana to replenish reserves that the utility drew down to offset supply problems during the mid-1970s.

MDU's supply situation is considerably improved compared to the relatively grim outlook of five to six years ago. At that time, a steady decline in MDU's reserve base forced the utility to cut back deliveries to interruptible industrial users and limit the number of new residential and commercial customers. The utility's reserve position began to turn around in 1978. Showing improvement in each subsequent year, reserve additions in 1980 were more than double 1980 production. By the end of 1980, MDU had over 950 bcf of natural gas reserves committed to its system, of which Montana sources represented 392 bcf. This compares to the 790 bcf available to the utility at the end of 1979 and shows an increase of 50 bcf in new Montana reserves in the course of just one year.[13]

Other Gas Utilities

Annual sales reports filed with the Montana Public Service Commission (PSC)[16] indicate that, in 1981, MPC sold 59 percent of the gas marketed in Montana directly to its own customers, whereas MDU accounted for 32 percent of total gas sales. Great Falls Gas Company, the third largest utility with 8 percent of the gas market, is primarily a distribution company—it obtains its gas supply from MPC at the city gate. Several other small municipal utilities and pipeline companies, including Cut Bank Gas Association, Consumers Gas Company, the Town of Kevin, Treasure State Pipeline Company, and Saco Municipal Gas Company have similar supply arrangements with MPC or with local producers. In combination, these smaller companies market less than one percent of the gas sold in the state.

CONSUMPTION

Utility Sales

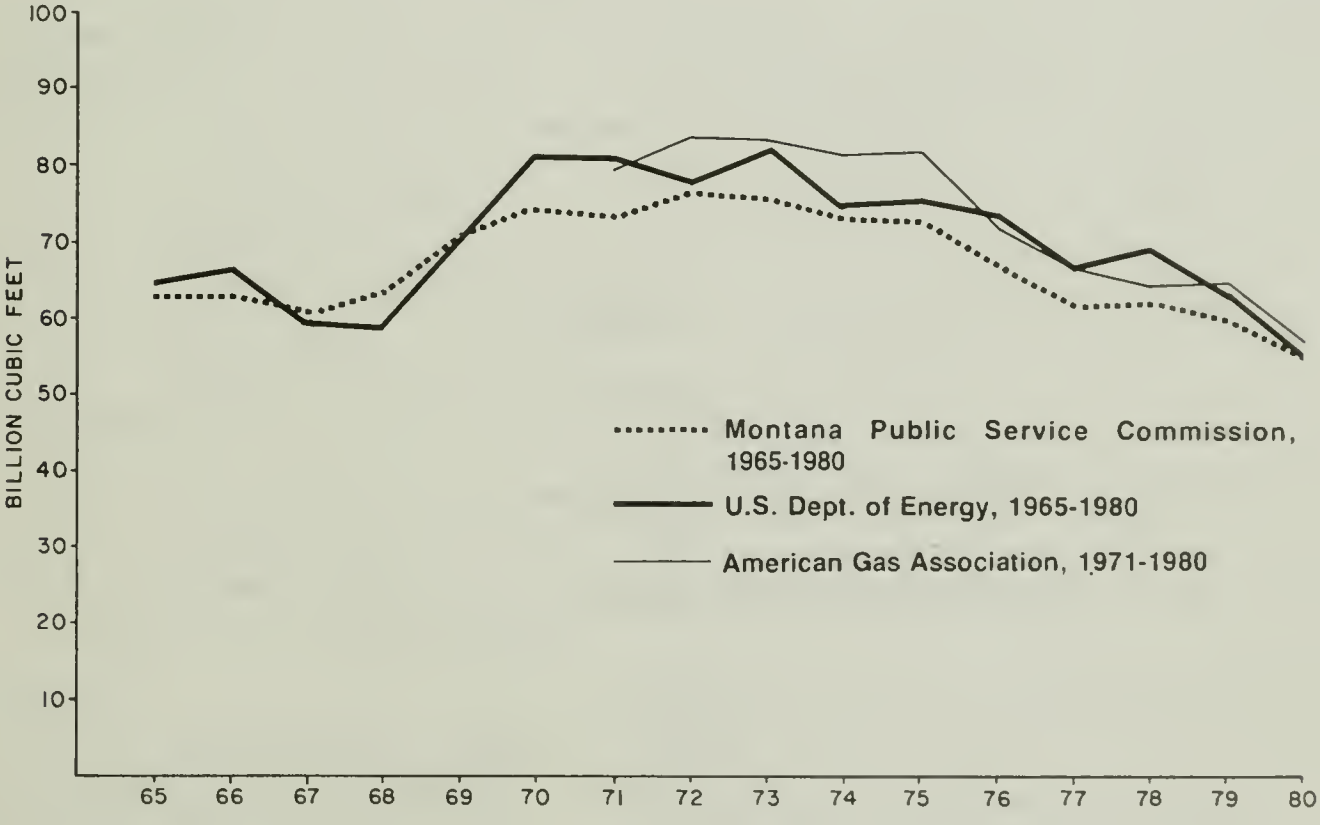
Despite a 21 percent increase in the number of gas consumers, Montana reduced its natural gas purchases by one-third during the past decade. Utility gas sales, which peaked in 1973, fell steadily throughout the 1970s.

The three sources of state consumption data, the Montana Public Service Commission,[16] the U.S. Department of Energy,[10] and the American Gas Association (AGA),[19] are compared in Figure 4. The PSC data are derived from annual reports on which the utilities list sales and disposition of gas during the year. Because most of the utilities aggregate residential and commercial sales, the reports do not provide a detailed breakdown of consumption by category of end use. Federal statistics, published by DOE (formerly compiled by the Federal Energy Administration and the U.S. Bureau of Mines), identify gas sales by customer classification. This data series, which had been based on voluntary surveys with partial estimation, was expanded and improved in 1980 with a new requirement for mandatory reporting. The federal data before this change are generally higher than the PSC figures.

A third source of state-level consumption data is the AGA's "Future Gas Consumption in the United States." This industry publication presents historical gas consumption data by state and class of service from 1971-1980. While this report provides a detailed listing of industrial consumption by Standard Industrial Code (SIC), the data are derived from utility surveys and may not be directly comparable to either the state or federal data series.

Because the federal data are more detailed than the PSC reports and more complete than the industry statistics, the DOE data provide a basis for examining general trends in the state's requirements for and use of natural gas. Patterns of consumption by end-use sector presented in Figure 5 are described in the following paragraphs.

FIGURE 4. COMPARISON BETWEEN DATA ON UTILITY GAS SALES, 1965-1980



Residential Sector

Using 19.3 bcf of gas in 1980 (about one-third of the state's total gas supply), 165,000 Montana households depend on natural gas for space and hot water heating, cooking, and clothes drying. Residential gas use, which surpassed industrial consumption for the first time in 1979, now accounts for the greatest share of Montana's total natural gas budget.

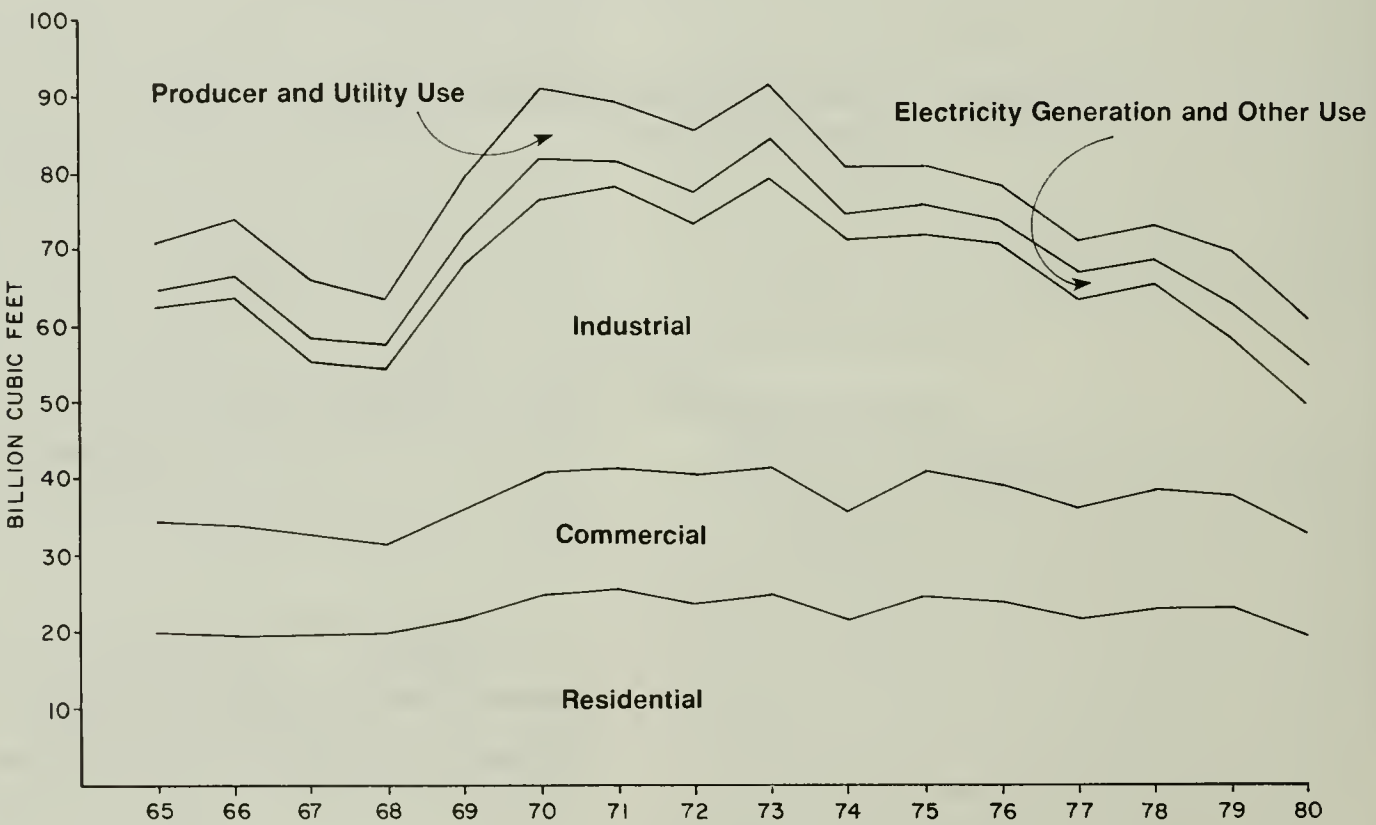
Residential conservation, prompted by escalating utility bills, has reduced household gas consumption nearly 30 percent since 1970; household use dropped from 176 mcf annually per household to 126 mcf in 1980. As a result of this decreased use, total gas consumption in the residential sector declined by 22 percent during the decade, despite the addition of approximately 35,000 new residential customers.

Commercial Sector

The commercial sector represents about 20,000 gas consumers in Montana and covers a broad range of trade, service, and government activities as well as agricultural and timber operations. Individual consumption patterns vary widely according to the size and type of the operation; the 13.6 bcf of gas consumed in 1980 reflects an average annual requirement of nearly 700 mcf for each user.

As with the residential sector, commercial use accounts for an increased proportion of the state's total gas consumption; 22 percent in 1980 compared to 17 percent in 1970. Even so, increased costs have compelled commercial users to cut back their overall gas requirements by 20 percent from peak demand of 16.8 bcf in the early 1970s.

FIGURE 5. NATURAL GAS CONSUMPTION BY END-USE SECTOR, 1965-1980



Industrial Sector

Once the major consuming sector, accounting for 40 to 45 percent of the state's total gas use, industry's reliance on natural gas has dropped markedly in recent years. Montana's industries consumed about 28 percent of the state's gas supply in 1980; less than half as much gas as in 1970. From peak requirements of 37.9 bcf in 1973, Montana's industrial demand plummeted to 16.7 bcf by 1980 because of conservation, fuel switching to coal and electricity, depressed market conditions, and plant closures.

The number of industrial consumers is quite small, totalling fewer than 500 users, whereas annual average consumption per customer of 35 million cubic feet (mmcf) is relatively large. The state's principal gas-using industries include mineral extraction and processing, and the manufacturing of paper and wood products, chemicals, food, and other materials. Within these diverse industries, the gas is used primarily as a boiler fuel to generate process steam, as a fuel for direct processing, and for heating and cooling. Industrial gas consumption by Standard Industrial Code for 1977 through 1980 is presented in Table 3.[19]

The utilities supply most industrial users on an interruptible basis. Interruptible contracts enable the industrial user to pay a lower rate, but contract volumes may be reduced if the utility develops supply problems. Interruptible customers faced the possibility of extended curtailment during the 1970s. Today, many industrial users are able to switch to an alternate fuel source on short notice.

TABLE 3
INDUSTRIAL NATURAL GAS CONSUMPTION BY STANDARD INDUSTRIAL CODE, 1977-1980

SIC Code	Description	Consumption (million cubic feet) 1977	1978	1979	1980
10-14	Mining	711	699	368	366
20	Food and Kindred Products	2,255	1,384	1,806	1,743
24	Lumber and Wood Products	1,311	867	758	521
26	Paper and Allied Products	3,601	3,854	3,782	3,766
27	Printing and Publishing	188	-	-	-
28	Chemicals and Allied Products	1,377	1,027	903	1,185
29	Petroleum and Coal Products	5,045	3,366	2,673	2,591
32	Stone, Clay, Glass, and Concrete Products	2,248	2,276	1,303	431
333-339	Primary Nonferrous Metals	8,069	6,853	7,311	4,978
37	Transportation Equipment	314	339	364	302
	Other SIC Classes	688	991	821	1,466
	TOTAL	**25,807**	**21,656**	**20,089**	**17,349**

Source: American Gas Association August 1982

Electric Generation

Montana has extensive hydropower resources; fossil fuel plants make up only one-third of the state's total electric generating capacity of 3,175 megawatts (Mw).[20] Most of the thermal generating plants are coal-fired, but natural gas can be used as either a primary or secondary fuel in six plants that have a combined capacity of 182 Mw.

In 1980, natural gas accounted for 7 percent of the 61.5 trillion Btu's (British thermal units) of fossil fuel energy expended for power generation in Montana.[21] Coal provided the greatest proportion of the utilities'

total fossil energy requirements, 92.9 percent, and #2 and #6 fuel oil furnished the balance. With its surplus supply of Canadian gas, MPC used nearly all of the gas consumed to generate power for off-system sales to out-of-state utilities.

Nearly 20 percent of the country's natural gas supply is used for generating electricity; in contrast, Montana's electric utilties consumed only about 7 percent of the state's gas supply in 1980. The use of gas for power generation by Montana's utilities is largely discretionary. Compared to the amount of gas used for power production when supplies were tight during the mid-1970s, less than one percent of total gas consumption in 1976, the proportion of gas used to generate electricity has increased substantially over the past several years.

Producer and Utility Fuel Use

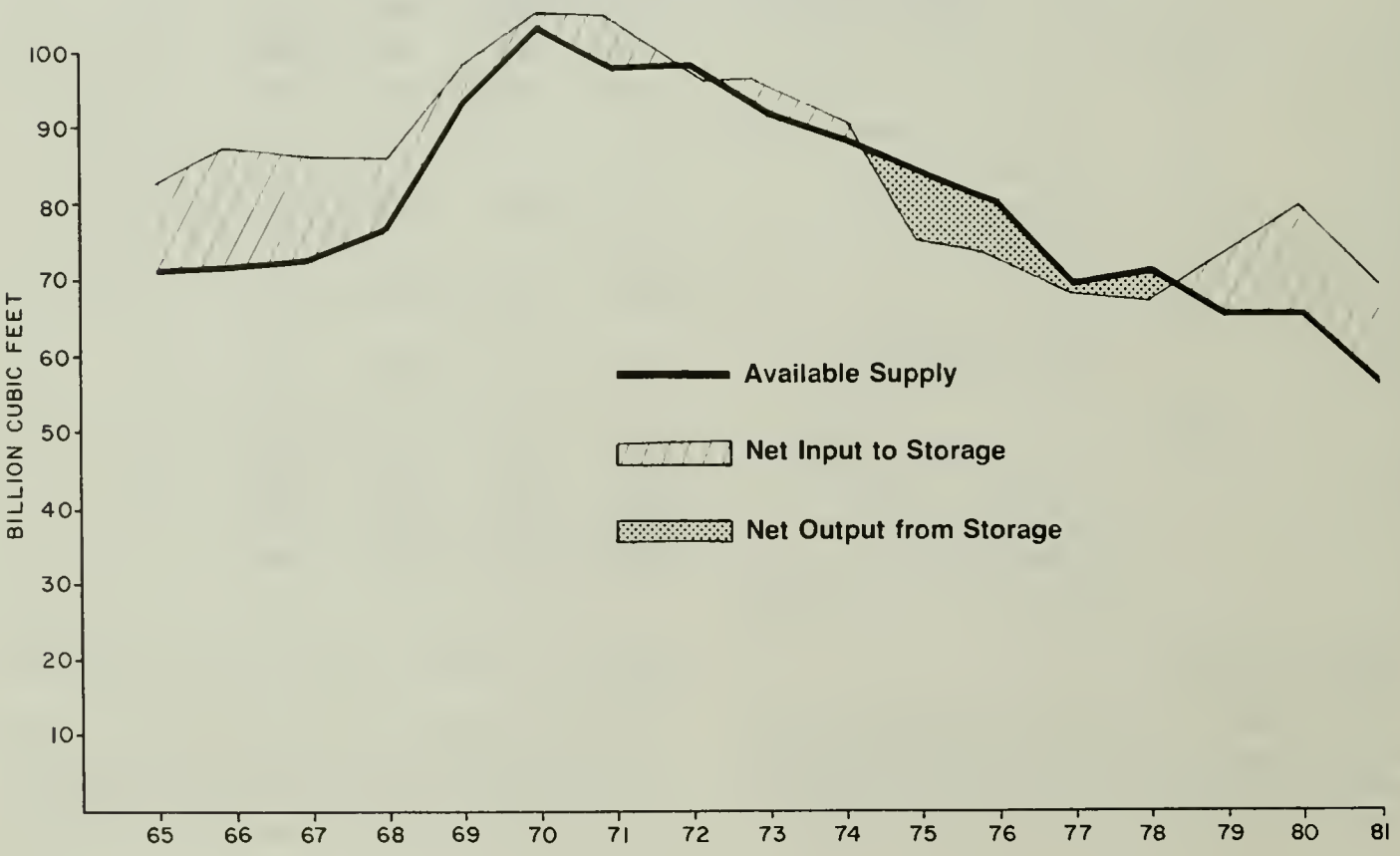
In addition to the gas that is marketed, substantial volumes are expended by the producers and utilities for extraction, processing, compression, and transportation. In 1980, wellhead operations, including natural gas processing and conditioning plants, used 3.4 bcf (5.6 percent) of the state's total gas supply. Another 2.8 bcf (4.7 percent) provided pipeline fuel for the utilities' distribution and marketing operations.

Net Change in Storage Reserves

Utilities typically maintain reserves of gas in underground storage facilities to provide a means for balancing gas supply with seasonal fluctuations in market requirements. In Montana, gas is usually injected into storage during the spring and summer, when market demand is less than the utilities' available supply. Gas is then withdrawn during the heating season to meet peak demand in the coldest winter months. In addition, Montana's storage reserves also functioned as a source of emergency supply to meet system requirements when shortfalls developed during the last decade.

MPC operates four storage reservoirs with a total capacity of 86 bcf. MDU maintains one large storage area near Baker that holds a maximum of 117 bcf.[22] Net annual inputs and withdrawals from the storage facilities relative to the state's overall annual supply for the period from 1965 to 1981 are depicted in Figure 6.[1] The data show a steady growth in reserves until 1972, when slightly more gas was withdrawn than injected. The utilities increased their stocks in 1973-74; but, from 1975 through 1978, the reserves served as a source of supplementary supply enabling the distributors to meet priority customer requirements. From 1979 through 1981, MDU and MPC replenished their reserves so that the storage facilities are nearly at the limit of rated reservoir capacity.

FIGURE 6. NATURAL GAS SUPPLY AND NET CHANGE IN STORAGE RESERVES, 1965-1981



IV. Government Regulation of the Natural Gas Market

Federal and state regulation of natural gas drilling and production parallel the requirements imposed on crude oil development. From the wellhead, however, the regulatory framework governing the transportation and marketing segments of the gas industry is entirely distinct from that of the liquid petroleum fuels.

NATURAL GAS ACT OF 1938

At the state level, the local distribution and marketing of natural gas has historically been subject to utility regulation. Since state authority is limited to intrastate transactions, the expansion of the transcontinental pipeline network in the 1920s and 1930s prompted Congress to establish federal authority over the gas industry. The Natural Gas Act (NGA) that Congress passed in 1938 (Public Law 75-688) was intended to regulate only the interstate market while leaving the states to control sales within their jurisdictions.

The NGA gave the Federal Power Commission (now the Federal Energy Regulatory Commission) rate-making authority over interstate pipeline tariffs and responsibility for issuing certificates of public convenience and necessity. In 1954, the Supreme Court (in *Phillips Petroleum Company v. Wisconsin)* greatly extended the scope of the NGA by ruling that gas delivered into interstate commerce is subject to wellhead price controls.

The *Phillips* decision created two distinct markets, a highly regulated interstate market and an intrastate market free of wellhead price controls. The dual market system laid the foundation for many of the disparities and problems that characterize the natural gas market today. It placed interstate pipelines at a competitive disadvantage in acquiring new gas reserves—their maximum bidding price was predetermined by the federal government. The reserves dedicated to the interstate market during this period were (and still are) very low cost, but the intrastate companies developed a stronger supply base by paying the gas producer more than the federal ceiling price.

This regulatory structure did not present a problem until the late 1960s and early 1970s, when overall gas reserves began a sharp decline while consumer demand continued to grow. Whereas reserve additions to the intrastate market remained steady during this period, new reserves committed to interstate markets dropped to nearly zero.[23] By the winter of 1976-1977, the situation reached critical proportions when shortages resulted in significant supply curtailments to the customers of some interstate pipeline companies.

NATURAL GAS POLICY ACT OF 1978

To rectify this situation and to provide the gas industry with greater financial incentives to find new gas supplies, Congress enacted the Natural Gas Policy Act in 1978 (Public Law 95-621). This legislation extended federal jurisdiction of natural gas to the intrastate market by establishing a complex schedule of price ceilings for all production of natural gas. The NGPA defined over twenty wellhead pricing categories based on such factors as: the provisions of the gas purchase contract; whether the reserves were tapped prior to 1977 (old gas) or after (new gas); and the physical characteristics of the reservoir, including the depth of the well and the geologic formation.

Under the NGPA pricing formulas, the Federal Energy Regulatory Commission decontrolled the price of high cost gas from deep reservoirs and unconventional sources in 1979. The controls on most other new gas are scheduled to expire on January 1, 1985. During the decontrol period, the law specifies that new gas prices will increase each month at the rate of inflation plus an additional multiplier designed to bring the price of new natural gas to the heat (Btu) equivalency price of crude oil by 1985. Most categories of "old" gas will remain under price controls until these reserves are exhausted. This pricing structure, which reflects a compromise between the gas industry and consumer groups, offers incentives for producers to find and develop new gas supplies but keeps a lid on the price of gas already in production.

The NGPA may be sound in principle; however, federal studies indicate that its practical application, combined with changed market conditions, may result in significant disorder in the natural gas market when new gas is totally decontrolled in 1985.[24,25,30] The potential extent and severity of these problems are uncertain because of the difficulty of predicting future energy markets. However, a discussion of the issues involved that affect Montana's producers and utilities may help in understanding the growing controversy, which is expected to be debated in the 1983 Congress.

Natural Gas Price Equivalency With Crude Oil and Petroleum Products

Natural gas competes with heating oil for residential space heating and with residual fuel oil in industrial and utility boiler fuel applications, but has historically cost less than the oil-based alternative fuels. Transportation and marketing costs differ for each energy resource; however, the disparity in oil and gas prices is mainly due to the federal regulations that held gas prices to average exploration and production costs plus a reasonable rate of return on capital investment. Oil prices, on the other hand, have been based on an international market strongly influenced by cartel agreements and production quotas. Though domestic oil prices were regulated in the United States throughout most of the 1970s, a price imbalance continued because of foreign oil imports and the relatively higher base prices of domestic oil to domestic gas.

When gas shortages began to develop in the 1970s, the federal price constraints contributed to a rapid growth in demand while offering insufficient incentive for exploration. Through the NGPA, Congress intended to correct this distortion by allowing new gas supplies to gradually rise to the price of crude oil by 1985.

When Congress established the phased escalation formula to achieve this goal, it was assumed that crude oil would cost $15 a barrel (in 1978 dollars) by 1985. However, because of the 1979 oil supply disruption, crude oil averages $30 a barrel as of March 1983 (about $22 a barrel in 1978 dollars). Consequently, even though the average price of natural gas at the wellhead has more than doubled since enactment of the NGPA in 1978, some analysts have predicted a jump in gas prices in January 1985 when all federal controls on new gas are lifted.

The magnitude of the price hike depends on future developments in the international oil market. Since the first quarter of 1981, surplus supplies have precipitated a significant decline in the price of oil. While the oil market is subject to sudden fluctuation, a continuation of this trend could greatly reduce or eliminate the disparity between oil and gas prices in 1985.

Also in question is the underlying assumption that, in a free market, natural gas at the wellhead will be equivalent in value to the full cost of crude oil. A more realistic assumption is that natural gas will remain competitive with alternative fuels. Considering the relative expense of transporting and distributing natural gas, there is a growing consensus that the wellhead price of deregulated natural gas would not be likely to exceed 70 percent of the cost of crude oil in 1985.[25]

While such a pricing formula may determine the market value of natural gas on a national basis, coal and wood are cheaper alternative fuels in Montana. Already, a significant number of industrial gas users have switched to coal and many residential gas consumers are installing wood stoves to reduce home heating costs. As the price of natural gas increases, the trend toward fuel switching, as well as conservation, is expected to continue. This situation is cause for concern, because in addition to paying a premium for the gas that they use, Montana consumers without fuel switching options may also have to absorb a greater percentage of the utilities' fixed costs, which will raise their utility bills even further.

Contractual Problems

The price of natural gas could climb even higher than the market clearing price on expiration of the NGPA, because of contract agreements between gas producers and distributors.[26] Many of the contracts currently in force were negotiated when interstate pipelines were facing curtailments. With gas purchasers focusing on securing supplies, gas producers were able to obtain very favorable terms of sale. Two types of contract provisions are most prevalent and have the greatest potential for creating significant market problems: clauses that provide for the immediate escalation of the sales price upon decontrol and take-or-pay provisions.

Price Escalator Clauses

The specific price escalator provisions vary according to the contract. Favored nation clauses stipulate that, in the event of decontrol, the price will be tied to the highest prevailing price in the area. Other escalation clauses specify that the wellhead gas price will be tied to the price of competing fuels, typically 100 to 120 percent of the New York harbor price of #2 fuel oil. Although the generalized price redetermination clauses are far more common, the two types of clauses in combination may push the average wellhead price of decontrolled gas to, or even beyond, the price of #2 fuel oil. Such a price would be considerably higher than the expected market value given the higher transportation costs for the gaseous fuels and the fact that many industrial users would quickly switch to the lower quality, but much cheaper, #6 residual fuel oil.

Take-or-Pay Clauses

An additional concern is the take-or-pay provisions specified in nearly all gas contracts. These clauses obligate the gas purchasers to pay for a certain amount, usually 85 to 90 percent of the gas tendered by the producer, even if delivery is not taken. Although such an agreement protects the producer from being shut-in by the gas distributor, the take-or-pay requirements are a growing problem as, even now, the NGPA price increases are holding down consumer demand. Because few contracts contain buyer protection clauses to allow the purchaser to renegotiate a lower selling price, many utilities and pipeline companies are currently faced with excess supplies of over-priced gas. This problem could become acute in 1985, if price escalation clauses are invoked following the decontrol of new gas.

If significant problems develop in the natural gas market following decontrol on January 1, 1985, the President or Congress could exercise a provision in the NGPA that allows an 18-month extension of price controls after July 1, 1985. Faced with the reimposition of controls, or with the possibility of such action, the gas industry may be induced to reconcile these contract problems independent of further legislative interference.

Decontrol of Old Gas

A compromise was negotiated for the phased decontrol of new gas—most old gas (that in production prior to the NGPA) will remain under federal price ceilings until these reserves are exhausted. This gas will represent 40 to 50 percent of the total domestic supply in 1985, and is expected to account for about 20 percent of the supply base in 1990.[25]

Advocates of complete deregulation hope to eliminate price controls on all categories of natural gas with the help of an administration committed to free market policies. Such help may be forthcoming. However, President Reagan delayed the Department of Energy's decontrol legislation until after the 1982 elections, because of the controversy the issue is expected to engender.

The focus of the debate is whether old natural gas should be priced according to its value in the marketplace, or whether the price should be restricted by government regulation under the present cost-based system. Because the current pricing structure has created significant variation in wellhead gas prices, from 21 cents to over $9.00 per mcf,[27] equity and competition among gas producers, distributors, and consumers are the primary issues for consideration.

Producers

For the producers, the NGPA's numerous pricing categories provide financial incentive for finding new gas reserves while minimizing excess profits on old gas. Exploration and production costs are not considered on a case-by-case basis. Therefore, the return to the producer is arbitrary, a function of circumstances rather than a reflection of either the actual investment or the value of the gas produced. From the producer's perspective, the price controls on old gas are inherently inequitable, since the gas cannot be sold for its market value.

In general, though, most producers of old gas have recouped their original investment costs and receive at least a nominal return on their investment. If allowed to rise to the market value, the price of this gas could increase five to ten-fold. Such an escalation would dramatically increase the profits of the producers of the old gas, but would add little to the country's gas supply. For these reasons and because 70 to 75 percent of the reserves of old gas are owned by the integrated oil companies,[28] consumer, labor, and other public interest groups are adamantly opposed to decontrolling old gas prices.[29]

From a national perspective, decontrol of old gas coupled with a stiff tax on excess producer profits is an attractive revenue raising idea to help offset the growing federal deficit. President Reagan has stated that he is opposed to a profits tax, but the producers themselves acknowledge that such a tax may be an unavoidable price of decontrol.

Distributors

Within the constraints of the federal price ceilings, the price that a gas distributor is willing to pay to acquire new supplies is determined by the adequacy and cost of its current supply base relative to its customers' requirements and projected demand. Pipelines and utilities charge their customers a weighted average price; therefore, distributors can subsidize their acquisition of new reserves by rolling-in high priced gas with their less expensive supplies.

Certain companies enjoy a competitive advantage in obtaining new supplies as well as in being able to offer their customers lower rates, because of their large reserves of old gas. Compared to the intrastate utilities, interstate pipeline companies hold a disproportionate share of the old gas reserves. Furthermore, the NGPA price ceilings for old gas committed to interstate markets are set much lower than for old intrastate gas.[23] This situation could lead to future supply and/or price imbalances between the interstate and intrastate markets as well as between individual gas distributors.[30]

Consumers

Consumer demand in an unregulated market is brought into balance with available supply at the market clearing price. Under the NGPA, Congress intended to balance supply while keeping a lid on old gas prices and gradually deregulating the price of new gas by restraining demand in the industrial sector. To accomplish this objective, the NGPA provides for incremental pricing to allocate increased gas acquisition costs to the largest industrial users served by interstate pipelines. Congress also enacted two companion bills that contain provisions regarding industrial gas consumption. The Power Plant and Industrial Fuel Use Act restricts the use of natural gas by industry and electric utilities; the Public Utility Regulatory Policies Act includes provisions for encouraging conservation through utility rate structure.

Under incremental pricing, the higher prices for new gas are passed on to industrial boiler fuel users in the form of a surcharge up to a ceiling price which is equivalent to the regional cost of an alternative fuel, #6 residual fuel oil. When the delivered price of natural gas reaches this "cap," further increases are averaged among other users.

Incremental pricing requires industrial users to absorb a disproportionate share of the costs of decontrol, and so apportions the benefits of the old gas cushion on the interstate market to residential, commercial, and small industrial users. Congress hoped that, by passing the higher costs for new gas directly through to the most price sensitive users, incremental pricing would keep the price of decontrolled gas from rising above the long-run market clearing price.[25]

Despite this policy objective, the average delivered price of natural gas is expected to approximate the price of alternative fuels following the decontrol of new gas in 1985.[30] Contract escalator clauses and take-or-pay provisions may even raise the delivered price beyond that of other energy sources. But, excessive prices would be likely to prompt industrial and residential fuel switching and cause a supply surplus until the price imbalance was resolved and the market stabilized.

Since natural gas prices will ultimately be constrained by the cost of competing fuels, federal studies question whether consumers will benefit by the extended price controls on old gas.[25,30] Each utility is in a unique position, however, with respect to its gas aquisition costs and contractual obligations. Therefore, this question may ultimately be decided on a case by case basis by state public service commissions in their review of each utility's rates and cost of service.

CRUDE OIL AND PETROLEUM PRODUCTS

I. Overview

As one of his first presidential actions, Ronald Reagan deregulated the domestic oil industry by executive order on January 28, 1981. This action abolished the post-embargo price and allocation controls on crude oil and petroleum products, and released the oil market from the complex federal regulations that had constrained the industry since 1973.

In the transition to a deregulated market, the oil industry is restructuring itself dramatically. Each company is critically examining its performance to eliminate or modify operations of limited profitability. Many of the larger companies, continuing a trend begun under the controls, are consolidating their market areas to focus on high volume sales rather than geographical coverage.

Except for the companies with refineries in the state, most of the major brand suppliers are withdrawing from the Montana market for reasons of economic efficiency. Several companies, including Mobil, Texaco, and Union Oil, began to pull out in the late 1970s. Although the allocation controls permitted the withdrawals, these marketers had to arrange alternative sources of supply for their customers. Shortly after President Reagan's decontrol order, Amoco and Phillips gave notice that they also planned to terminate their Montana operations.

One company, Simmons Oil, entered the Montana market when it purchased the Phillips refinery in 1981, and another four suppliers increased their sales volumes; however, fourteen other companies reduced their relative market share in recent years. This realignment means that Montana will rely on just a few major companies and several smaller independent refiners for its petroleum fuel supply.

The integrated major oil companies produce a significant proportion of the oil that they refine, but the independent refiners obtain most of their crude oil from other firms. To equalize refiners' access to crude oil at competitive prices, the federal controls had required the major companies to subsidize the independents through the entitlements and buy-sell programs (see page 31). Since deregulation, the independent refiners must compete with the major companies without governmental protections.

A surplus of crude oil on the world oil market, caused by price-induced conservation and economic recession, has eased the transition to decontrol for the crude-short independent refiners. At the same time, however, reduced consumer demand is contributing to sharp competition among fuel suppliers.

The refiners' treatment of their own customers reflects the intensity of the competition that extends to the wholesale and retail levels of the petroleum market. In testimony before the House Subcommittee on Fossil and Synthetic Fuels in June 1982, the National Oil Jobbers Council (NOJC) expressed concern over the price and allocation policies adopted by some refiners since decontrol. The NOJC testified that many refiners have instituted pricing policies that favor refiner-owned stations, while discriminating against the independent jobber (fuel wholesaler). In some cases, refiners have restricted allocations to jobbers, but provided company-owned or operated stations with unlimited access to fuel supplies. An additional problem is that nearly all of the companies tightened their credit terms, and some suppliers are shifting credit card costs to the distributor.[31]

A 1982 survey conducted by the Intermountain Oil Marketers Association,[32] an affiliate of the NOJC, underscores the impact of these marketing practices on Montana jobbers. Asked if they would support state legislation to prevent refiners from direct marketing (refiner divorcement), 80 percent answered affirmatively. Over half of the state's jobbers are having problems with below cost selling in their areas; two-thirds believe that the Montana Unfair Trade Practices Act needs to be strengthened and rigorously enforced.

An unprecedented drop in consumer demand is compounding the problems of the fuel marketers, whose income is tied directly to their sales volumes. The United States oil consumption, which fell by 8 percent in 1980—the largest one-year decline ever, dropped another 6 percent in 1981.[33] Paralleling the national trend in 1980, Montanans reduced motor gasoline consumption by 8 percent[34] and distillate fuel requirements by 11 percent.[35] In 1981, however, Montana's taxable sales of motor gasoline remained stable with a .2 percent annual growth, whereas distillate deliveries increased by 7 percent, primarily as a result of the drilling boom in eastern Montana.

Until the economy recovers from the current recession and the crude oil glut disappears, the long-term changes in fuel demand and the structural realignment of the domestic oil market will not be fully apparent. For an understanding of the present market structure and recent oil industry trends in Montana, this report presents an overview of the state's petroleum production, distribution, and marketing system. In addition, federal and state contingency planning for oil shortages is also discussed, because, despite the world glut, petroleum supplies continue to be threatened by political disruption.

II. Montana's Crude Oil Resource

RESERVES

Montana's oil fields, first tapped for commercial production in 1916, currently contain about 200 million barrels of proved reserves.[5] Reduced from an estimated 450 million barrels in 1968, oil discoveries did not replace the state's annual production throughout the last decade.

Following the downward trend shown in Figure 7, U.S. reserves also began to decline after the 1968 discovery of the Prudhoe Bay field.[2,36] Domestic petroleum reserves have stabilized in the past three years at about 30 billion barrels.

Recent trends in Montana's oil reserves are uncertain, because of differences between data sources. The state's reserve estimates vary according to the methodology used to determine the figures. The Department of Energy reports that, based on its 1981 survey of producers, 186 million barrels of crude oil may be commercially recoverable using present technology.[2] By comparison, the Montana Department of Natural Resources and Conservation's figures,[5] derived from volumetric data and production decline curves, show a higher reserve base of 203 million barrels.

A third source of data, the American Petroleum Institute (API) compiled annual oil reserve statistics for each state prior to 1980.[36] The API, an industry organization, provided the only assessment of the nation's oil reserves until 1977, when the Congress directed DOE to appraise the country's petroleum resources independently. Now relying on the federal statistics, the API discontinued its duplicative survey of producers with the publication of the 1979 reserves.

Figure 7 compares the state, federal, and industry estimates of Montana's proved oil reserves for the period from 1965 to 1981. Although the state's figures are consistently 30 to 40 percent higher than the industry's calculations, the year-to-year trends are very similar. The DOE's reserve estimates are also larger than the industry's assessment, but by a smaller 10 to 15 percent margin. In 1981, however, the reserve trends diverge. The DNRC figures show a substantial drop in proved reserves, whereas federal data indicate an increase. Although there is no apparent explanation for the disparate estimates, the difference between the two data sources is now substantially reduced.

Although Montana's proved oil reserves represent only .6 percent of total domestic reserves, the U.S. Geological Survey's data indicate that Montana has the geological potential for contributing a greater share of the country's oil supply. The USGS assessment of Montana's undiscovered oil reserves are presented in Table 4 for each of the state's major geological provinces.[3] Since several of the basins overlap with neighboring states, and the data are nor apportioned by state, the areal percentage of each basin in Montana is used to approximate the potential volume of oil that may be found in Montana.

TABLE 4
MONTANA'S UNDISCOVERED RECOVERABLE CONVENTIONAL RESOURCES OF CRUDE OIL

		Estimated Resource Potential (billion barrels)			
Basin	Area in Montana (percent)	Low (p = .95)	High (p = .05)	Mean $\bar{x}$	Standard Deviation
Montana Overthrust	100	0	2.0	.6	.9
Sweetgrass Arch/Bearpaw Uplift	100	.1	1.2	.4	.4
Southwest Montana	100	0	.6	.2	.3
Big Snowy Uplift	100	negl.	.4	.2	.1
Big Horn Basin	13	negl.	.3	.1	.1
Williston Basin	18	.1	.6	.3	.2
Powder River Basin	31	.2	.9	.4	.2
STATE TOTAL				**2.2**	**1.1**

Source: U.S. Geological Survey. 1982.

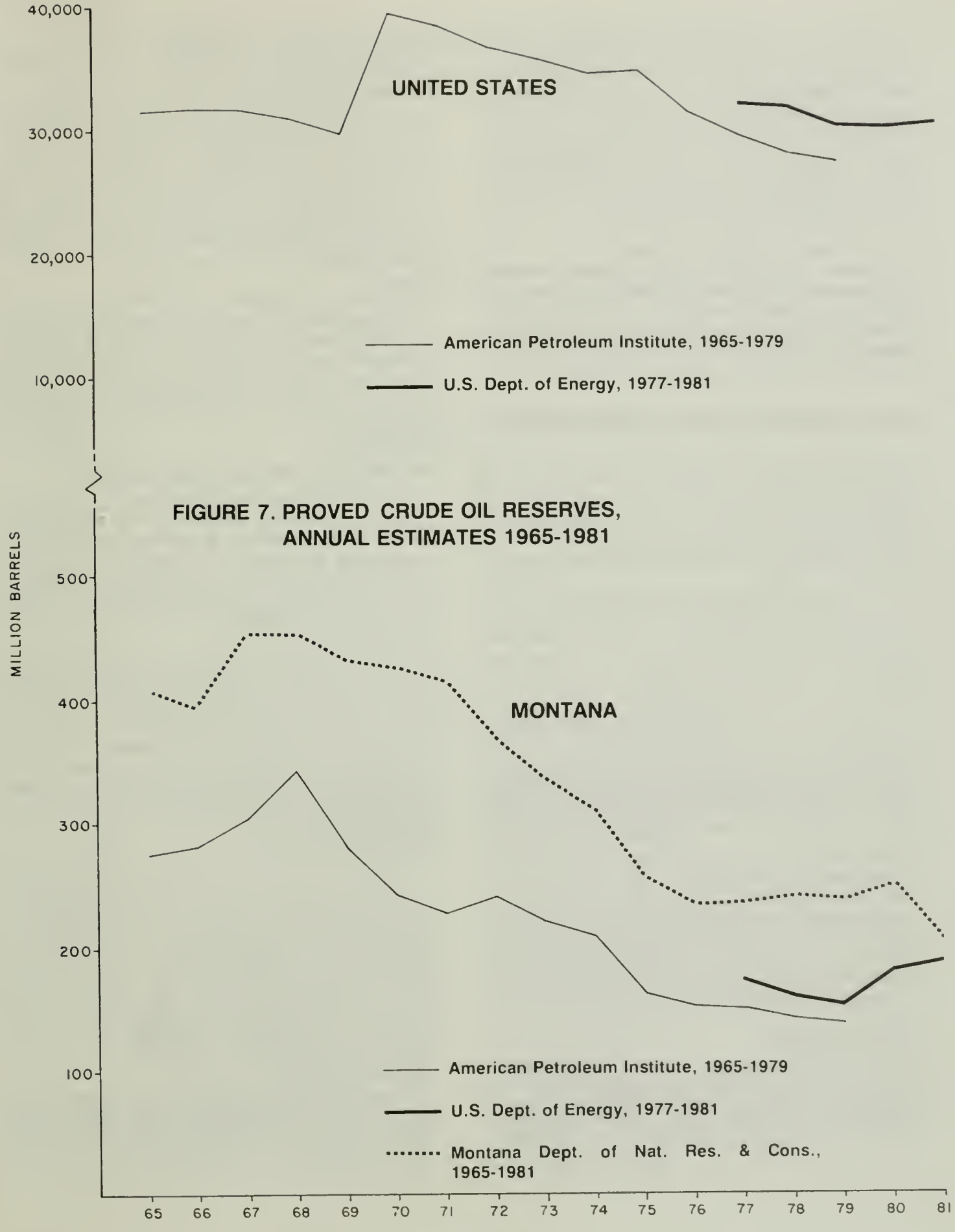


FIGURE 7. PROVED CRUDE OIL RESERVES, ANNUAL ESTIMATES 1965-1981

These data indicate that an additional 2.2 billion barrels of recoverable crude oil may be obtained from conventional sources under current economic conditions, using present technology. As described for natural gas, the Montana Overthrust Belt has the greatest hydrocarbon potential, but is also the area of greatest uncertainty. The Montana portion of the Powder River Basin and the Sweetgrass Arch in north central Montana follow the thrust belt in petroleum potential.

If 2.2 billion barrels of crude oil are actually discovered in addition to known reserves, Montana could sustain current production levels of 30 million barrels a year for approximately 80 years. Compared to the mean value of undiscovered U.S. reserves of 82.6 billion barrels, Montana's oil resource could represent 2 to 3 percent of the country's total petroleum reserves.

EXPLORATION AND DEVELOPMENT

Recent trends in the exploration and development of Montana's hydrocarbon reserves are discussed in the "Natural Gas" section, (see page 4). General patterns of seismic study and leasing activity are presented in that overview; the results of exploratory and development drilling for crude oil are described in the following paragraphs.

In 1981, the oil industry completed 402 new oil wells in Montana. In that record year for petroleum exploration, the number of new oil wells increased 50 percent over the 271 oil wells completed in 1980—and is more than two and a half times the number of new oil wells in 1979.[5]

The focus of industry attention, the Williston Basin supported a high ratio of successful drilling that brought the number of producing wells to 1,080 in 1981, up from 996 in 1980. Northern Montana ranked second in rig activity, with 68 new producing wells tapping the relatively shallow formations of the Sweetgrass Arch and the Bearpaw Uplift.

Exploratory drilling uncovered 29 new oil fields in 1981. Reflecting a 23 percent success ratio, 126 of the 552 wildcat wells drilled into previously untested areas uncovered commercial oil deposits. By comparison, twice as many (46 percent) of the nearly 600 development wells drilled in areas of known hydrocarbon potential succeeded in finding oil.

PRODUCTION

As a result of the industry's drilling success, crude oil production increased by 1.2 million barrels in 1981, an average gain of 3,369 barrels of oil per day.[5] Representing a 4 percent growth in production, from 29.6 million barrels in 1980 to 30.8 million barrels in 1981, the higher output is the first upturn since 1973.

Montana's annual production of crude oil for the period from 1965 through 1981 (shown in Figure 8) is based on data collected by the Department of Natural Resources and Conservation. DNRC is the primary source of crude oil production statistics; both federal and industry figures are derived from the state's data. The Montana Department of Revenue also reports annual oil production in conjunction with its tax collection responsibilities;[9] its data closely approximate the DNRC figures.

As shown in Figures 9 and 10, Montana's oil producing regions vary in total annual output and production patterns as well as in average yield per well. Regional production trends for the period from 1965 through 1981 are discussed in the following paragraphs. It should be noted that, although the USGS identifies seven geological basins in Montana, only five basins currently produce crude oil.

Sweetgrass Arch and Bearpaw Uplift

Following the discovery of the Kevin Sunburst field in 1922, oil production from northern Montana gradually increased until culminating at 8 million barrels in 1966. Contributing 23 percent of the state's oil production in that year, annual output declined steadily thoughout the 1970s. In the past several years, production has stabilized at 3.6 million barrels, about 12 percent of total state production.

With nearly 60 percent of the state's 4,020 active oil wells, the Sweetgrass Arch and the Bearpaw Uplift support more wells than any of the other producing areas. But, because the average yield per well of 4 barrels per day (b/d) is only one-fifth the state average of 21 b/d, the relatively shallow oil fields of northern Montana are the least productive on a per well basis. Even so, the region ranks third in total output among the state's five producing oil provinces.

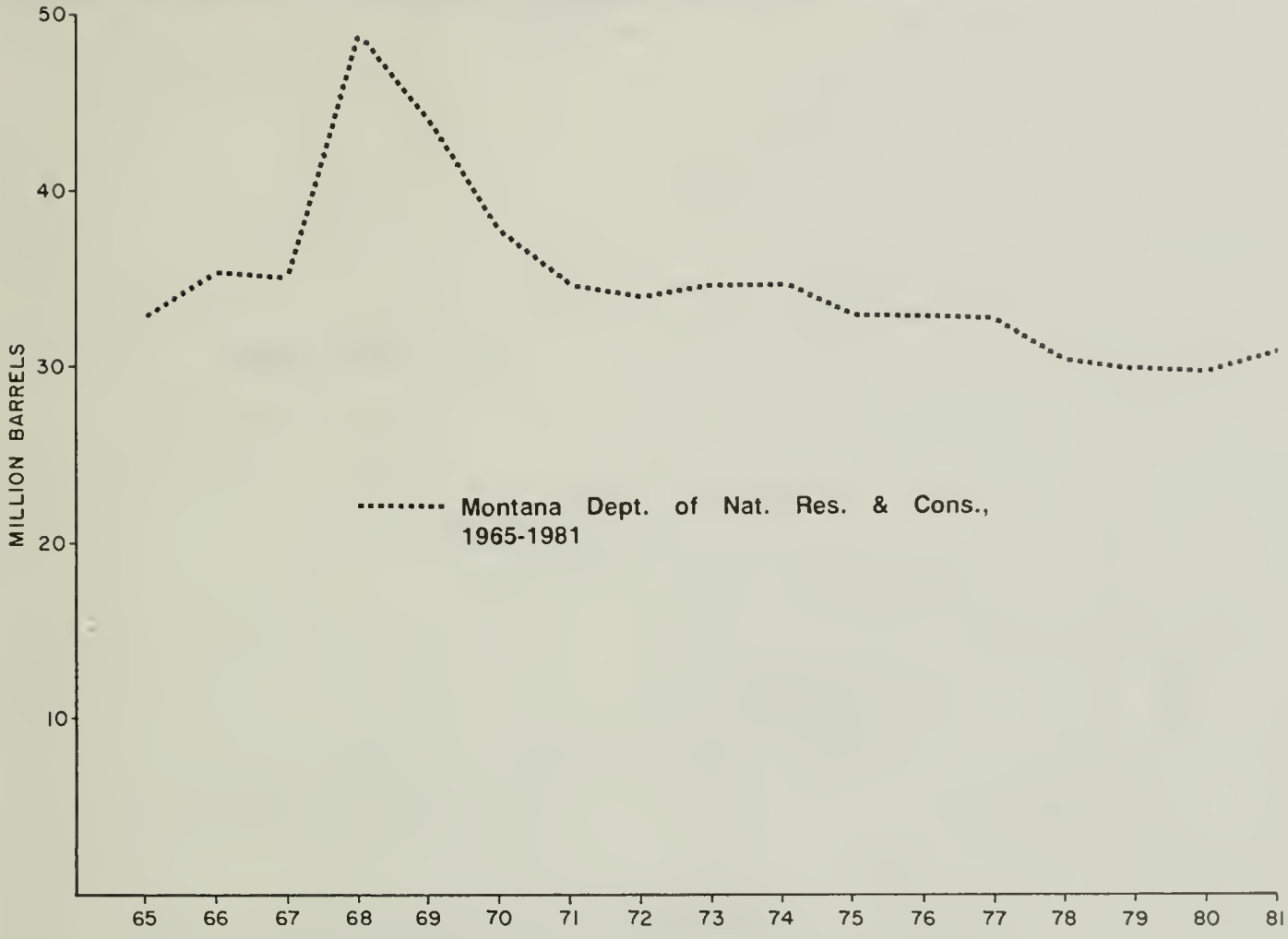
Big Snowy Uplift

Following a decline in the 1960s, oil production from the Big Snowy Uplift in central Montana more than doubled during the first half of the 1970s, yielding 4.1 million barrels in 1976 compared to 1.9 million barrels at the start of the decade. Since that time, a 50 percent reduction in the average output per well cut back production to 2.6 million barrels in 1981. Because of this reversal, the Big Snowy Uplift supplied only 8 percent of Montana's oil production in 1981 from about the same proportion of the state's producing wells.

Big Horn Basin

Crude oil output from the state's oldest producing fields in south central Montana dropped from 3.6 million barrels in 1965 to .9 million barrels in 1981. Whereas the

FIGURE 8. CRUDE OIL PRODUCTION, ANNUAL, 1965-1981



Big Horn Basin measured the highest yield per well, over 100 b/d before 1968, withdrawals have subsequently declined to 19 barrels daily. With about 3 percent of the state's producing wells, the region provides approximately the same percentage of Montana's oil production.

Williston Basin

Extending eastward into North Dakota, the Williston Basin is Montana's most productive oil-bearing province. Following its discovery in 1951, production grew rapidly until reaching 21.3 million barrels in 1966. Although annual production from the relatively deep formations of the Williston Basin dropped back to 14 million barrels by the mid-1970s, new discoveries in the past several years have reversed the downward trend and pushed output back up to 20 million barrels.

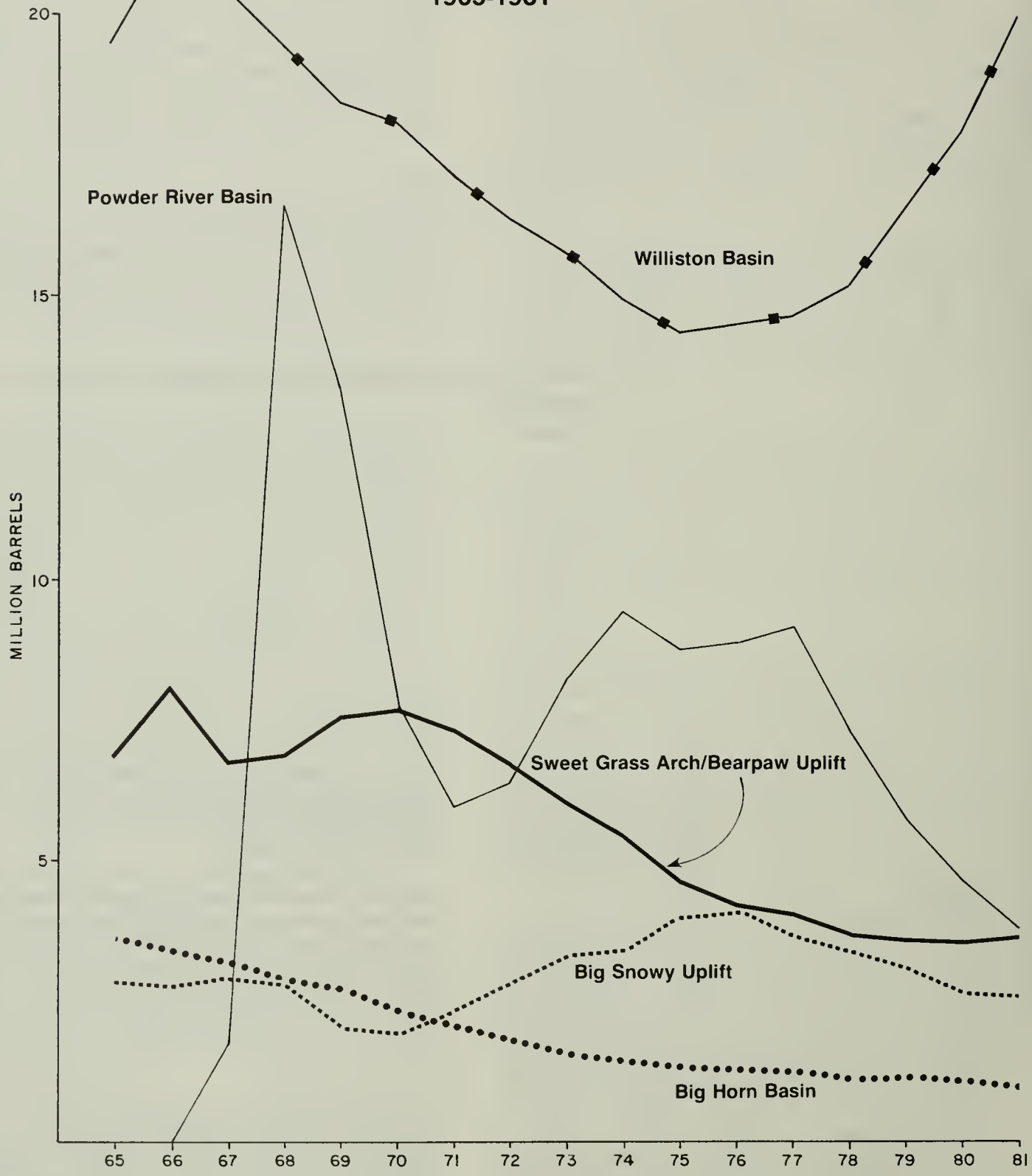
The Williston Basin contributes 65 percent of Montana's oil production, from just over one quarter of the state's wells. While the number of producing wells has increased as a result of the upturn in exploration activity, the average daily production per well of about 50 b/d has stabilized following a gradual decline from the 70 b/d produced during the 1960s.

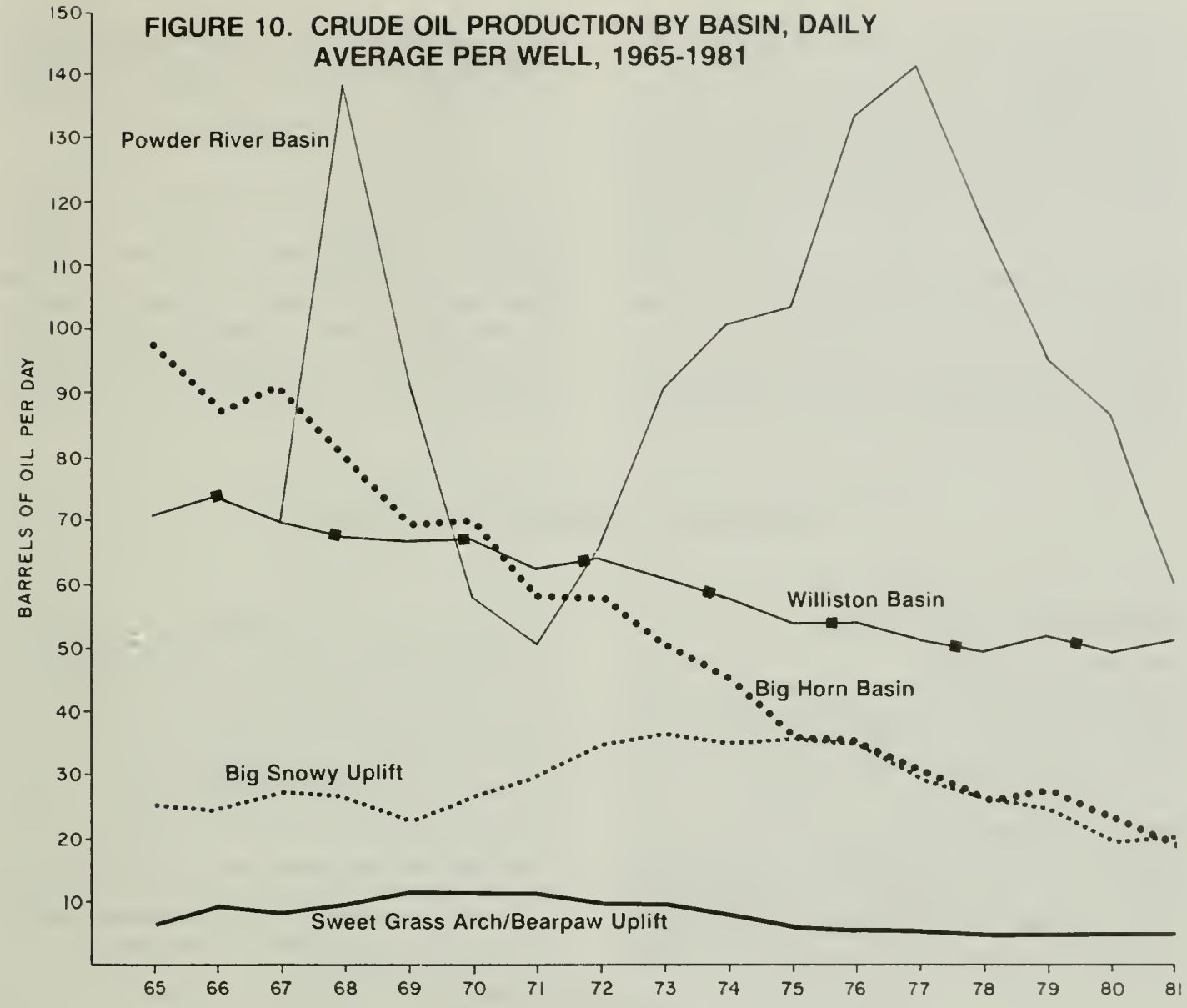
Powder River Basin

Following the discovery of the Bell Creek oil field in 1967, oil production from the Powder River Basin in southeast Montana surged to 16.6 million barrels, about one-third of total state production in 1968. Unable to sustain such a rapid rate of drawdown, however, production dropped sharply in subsequent years, averaging 8 to 9 million barrels during the period from 1973 to 1977. Since that time, annual output has slid even further, to 3.8 million barrels in 1981, 12 percent of Montana's oil production.

With about 4 percent of the state's wells, the Powder River Basin is the most productive region on a per well basis. But, compared to the 138 b/d of average output obtained in the initial years of production and again in 1977 (over 140 b/d), the average yield in 1981 of 59 b/d is considerably reduced.

FIGURE 9. CRUDE OIL PRODUCTION BY BASIN, ANNUAL, 1965-1981





DISPOSITION

Pipelines are the most economical land-based transportation systems for moving large volumes of crude oil from the wellhead to a refinery. Because petroleum pipeline companies are primarily transporters rather than purchasers of crude oil, most crude pipelines are common carriers. As such, pipeline transportation facilities for crude oil are far more accessible than natural gas pipelines.

Two major pipeline systems transport crude petroleum within Montana: the Butte and Western Crude Oil Pipelines, which extend north-south along the eastern border; and the Glacier (Continental) Pipeline, which bisects central Montana from the eastern edge of Glacier Park to Billings and south to Wyoming. Supplementing these systems, the Simmons Pipeline to Great Falls parallels the Glacier Pipeline, the Exxon Pipeline delivers oil from south central Montana and Wyoming to Billings, and the Portal Pipeline gathers oil in the northeast corner of the state for shipment to North Dakota. The Wascana Pipeline, which intersects the Western Crude Oil Pipeline at Poplar, Montana, can deliver Williston Basin crude into Canada, but it is not in operation at this time.[37] All are shown on the accompanying map at the back of this report.

Within the constraints imposed by the location and orientation of the pipeline system, wellhead ownership rights and contract agreements determine the disposition of Montana's oil production. Refiners acquire oil by direct production, purchase, or through exchange agreements. Exchanges are swapping transactions whereby oil in one location is traded for oil in another area. Exchanges involving both crude oil and petroleum

products are used extensively in the oil industry to save transportation costs.

The physical disposition of Montana's oil production is greatly influenced by the present pipeline distribution system. Since the transportation network does not link the oil fields of eastern Montana to the state's larger refineries in the Billings area, most of the oil produced from the Williston and Powder River basins is not available for refining in Montana. As a result, about 70 percent of total state production is shipped east to North Dakota or south to Wyoming for delivery to out-of-state refiners.

Department of Energy data indicate that Montana oil producers export nearly half of total production to Midwest states, including Indiana, Illinois, Kansas, Minnesota, and Wisconsin.[38] While refineries as far distant as Pennsylvania receive a small fraction of Montana's oil, North Dakota and Rocky Mountain refiners obtain the balance of the exported crude.

About 30 percent of Montana's oil production, 8 to 9 million barrels annually, is retained within the state and processed into finished petroleum products. Instate production is the main feedstock of the smaller refineries in Great Falls, Cut Bank, and Wolf Point, but the three larger refineries in the Billings area depend heavily on outside sources of crude oil to supplement their supplies of Montana oil.[5] The operations and crude oil requirements of the state's six refineries are described in the following section of this report.

III. Montana's Liquid Fuel Supply

REFINERY PRODUCTION

Refineries convert crude petroleum to transportation, heating, and boiler fuels as well as to other usable products including asphalt, lubricants, road oil, and petrochemical feedstock. The basic process common to all refineries is fractional distillation whereby oil is heated and the various chemical components, or fractions, vaporize at different temperatures. More sophisticated refineries have additional units to further treat the raw products, especially the heavier fractions, using pressure and catalysts. Other processing units remove impurities such as sulfur, salt, and trace metals. The liquids are then blended together, with or without additives, to produce the products desired.

In the first downturn in refinery capacity since 1966, the United States experienced a sharp decline in the number of petroleum refineries in 1981. The shutdown of 23 plants, with a combined daily capacity of 700,000 barrels, reduced total operable capacity to 17.9 million barrels per day.[39] Of this total capacity, 1.8 million barrels were idle, but capable of restarting within 90 days. In 1982, the pace of refinery closures accelerated even further, as an additional 52 refineries, totalling 1.2 million barrels of capacity, are expected to be permanently shutdown by the end of the year.[40]

To a large extent, fuel conservation efforts and economic recession underlie the cutback in refining operations. Since peaking at 18.8 million barrels a day in 1978, the volume of petroleum products sold in the U.S. has dropped 15 percent, to 16.1 million barrels daily in 1981.[33] Compounding the unprecedented decline in consumption, the refining industry is restructuring itself, after nearly a decade of federal regulation, in favor of large, integrated, and efficient facilities.[41]

In January 1981, President Reagan's decontrol of the oil industry ended the federal regulations that ensured small refiners a source of crude oil at costs competitive with the large integrated refining companies. Faced with fiercer competition and, in many cases, the need to upgrade their facilities to produce a greater proportion of the more profitable lighter products or to handle lower quality crude oil, a number of small refiners have gone out of business.

Because consumer demand for the lighter transportation and heating fuels greatly exceeds demand for the residual fuel oils, the need to upgrade existing facilities is an industry-wide problem. An additional impetus for improving refinery operations is that the quality of crude oil available for processing is progressively declining due to the increased supply of Alaskan oil, enhanced recovery of heavy domestic crude, and the fact that producing countries are requiring companies to take a greater proportion of heavy, high sulfur crude oil.[41]

Processing Capacity and Sources of Crude Oil

Montana's six refineries can process a maximum of 154,250 barrels of crude each day.[33] The permanent shutdown of 1,200 barrels of daily capacity during 1981 reduced the state's refining capability by only a small margin, but an additional 8,000 barrels, about 5 percent of operable capacity, remained idle during the year.

The three large plants in the Billings area dominate the refining industry in Montana. In combination, Exxon, Conoco, and Cenex processed 34 million barrels, nearly 90 percent of the total oil refined during 1981.[5] The fourth largest facility, the Simmons Refinery near Great Falls (formerly owned by Phillips Petroleum Company), converted approximately 1.9 million barrels of crude oil

into finished products. The two smallest plants, Flying J (formerly Westco) in Cut Bank and Kenco in Wolf Point, each refined about 1.5 million barrels in 1981. Table 5 summarizes refinery capacity, average throughput and plant utilization, and source of crude oil feedstock.

Historically, the state's refiners supplemented Montana crude oil with supplies from Wyoming. While the refiners obtained small volumes of Canadian oil during the 1950s, the completion of the Glacier pipeline in 1962 provided transportation facilities for delivering significant quantities of Canadian crude to the Billings area. The availability of Canadian imports contributed to a substantial growth in refining capacity through the 1960s and early 1970s.

Reliance on Canadian oil peaked in 1973, when imports of 24.3 million barrels made up nearly 50 percent of total feedstock. Whereas Wyoming and Montana oil supplies have remained relatively stable in recent years, the volume of oil imported from Canada has been cut in half since 1979, totalling 11.8 million barrels in 1981, 30 percent of the oil processed. Figure 11 shows the relative volumes of Montana, Wyoming, and Canadian crude oil received by the state's refineries from 1965 through 1981.

Because of the downturn in petroleum product demand, Montana's refiners operated at about 69 percent of total plant capacity in 1981. By comparison, refinery utilization averaged 79 percent in 1980 and 90 percent in 1979. While each refinery varied in its operations during the year, the state's smaller facilities were apparently less affected by reduced fuel demand than the Billings area refiners.

The productivity of the smaller Montana refiners is in direct contrast to the national trend wherein the elimination of the federal controls and changed market conditions have caused many small refiners to go out of business. In part, this may be because Montana's smaller refiners obtain nearly all of their feedstock from relatively stable instate sources. Moreover, to a large extent, they supply local markets along the hi-line and through central Montana that are not readily served by other fuel distribution facilities.

Product Mix

The quantity of each type of petroleum product derived from a barrel of crude oil is different for each refinery because it depends on the processing capability of the facility. The small Kenco refinery, unable to produce gasoline, emphasizes production of the heavier distillate and residual fuels. The Exxon refinery, on the other hand, is the only Montana refinery with the special equipment required to manufacture aviation gasoline.

The larger refineries in the state are flexible with respect to the relative volumes of gasoline and distillate fuel oil produced. For example, a complex refinery processing light crude oil and maximizing gasoline production can increase its distillate production by 10 to 15 percent by reducing gasoline output by about 5 percent.[42]

The proportionate volume of each fuel produced also depends on the quality of crude oil that the refinery processes. More of the lighter products such as gasoline and distillate can be extracted from light crude oils, such as Canadian crude oil, than from heavier crude oils like those from Wyoming.

The relative proportion of the different types of fuel produced in 1981 is summarized in Table 6.[43] Although slight shifts in refinery emphasis can be detected, there is little change in the mix of fuels produced during the past several years.

TABLE 5
REFINERY CAPACITY AND PROCESSING TRENDS, 1981

Refinery	Location	Operable Capacity (b/d)	Crude Processed (b/d)	Capacity Utilized (percent)	Source of Crude Oil (percent)			
					MT	WY	ND	Can.
Conoco Inc.	Billings	52,500	35,835	68.3	21.9	24.3	.1	53.7
Exxon Co., USA	Billings	45,000	35,410	78.7	4.0	79.2	-	16.8
Farmer's Union Central Exchange Inc. (Cenex)	Laurel	41,650*	22,436	53.9	8.8	60.8	-	30.4
Flying J Inc.	Cut Bank	4,400	4,068	92.5	100.0			
Kenco Refining Inc.	Wolf Point	4,700	3,760	80.0	100.0			
Simmons Oil Co.	Great Falls	6,000	5,269	87.8	91.7			8.3
TOTAL		**154,250**	**106,778**	**69.2**	**22.4**	**47.2**	**neg.**	**30.4**

*Includes 8,000 b/d of idle capacity.

Sources: U.S. Department of Energy, Energy Information Administration. July 1982.
Montana Department of Natural Resources and Conservation. 1981.

FIGURE 11. REFINERY RECEIPTS OF CRUDE OIL BY SOURCE, 1965-1981

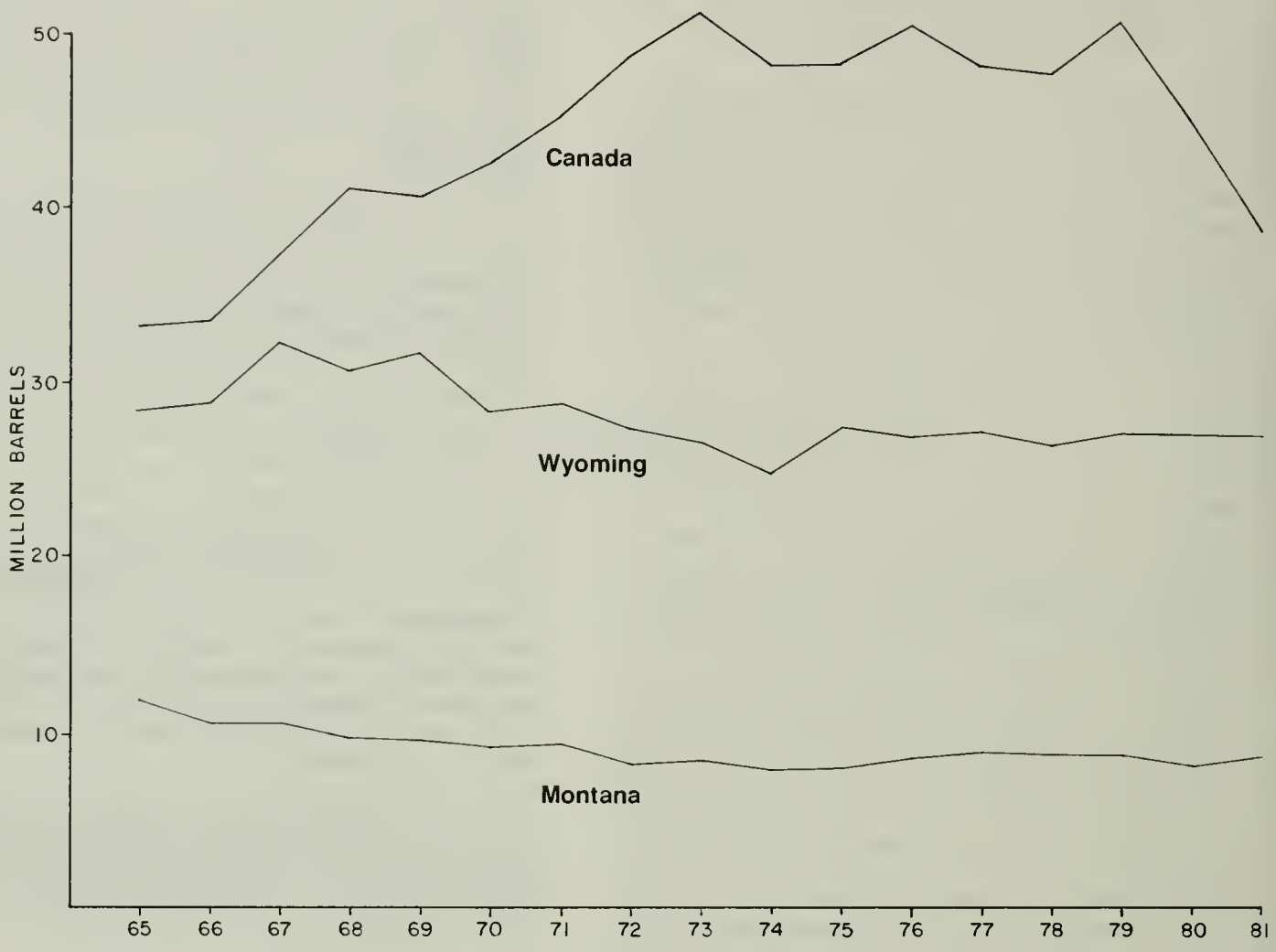


TABLE 6
REFINERY OUTPUT BY FUEL TYPE, 1981

Product	Volume (thousand barrels)	Percentage
Motor Gasoline	21,067	51.2
Aviation Gasoline	99	.2
Jet Fuel	3,086	7.5
Distillate Fuel Oil, Kerosene	9,218	22.4
Residual Fuel Oil	1,344	3.3
Coke, Asphalt, Road Oil	4,426	10.8
Petrochemical Feedstock	19	negL.
Still Gas (Refinery Fuel)	1,668	4.1
Other Products	230	.6
TOTAL	**41,157**	**100.1***

*Product percentages do not add to 100 percent due to independent rounding.

Source: U.S. Department of Energy, Energy Information Administration. 1981.

PRODUCT DISTRIBUTION

As part of the regional fuel distribution system, Montana is a net importer of aviation gasoline, propane, and residual fuel oil and a net exporter of motor gasoline, distillate fuel, and jet fuel. For each product, Table 7 compares refinery production to the amount of fuel supplied in 1981 and the proportion of net import or export.

Pipelines move motor gasoline, distillate fuel oil, and jet fuel from one population center to another, and tanker trucks transport it from the bulk terminals to its destination. Aviation gasoline, propane and residual fuel are usually carried directly from the refinery (or gas plant) by truck or railroad tanker to its destination.

TABLE 7
REFINERY PRODUCTION COMPARED WITH FUEL SUPPLY, 1981

Product	Refinery Production (thousand barrels)	Montana Supply (thousand barrels)	Net [Import] or Export (thousand barrels)	Percentage [Import of Total Supply] or Export of Total Production
Motor Gasoline	21,068*	10,838	10,230	49
Aviation Gasoline	99	160	[61]	[38]
Jet Fuel	3,086	674	2,412	78
Distillate, Kerosene	9,218	6,512	2,706	29
Residual Fuel Oil	1,344	2,519	[1,175]	[47]
Propane	398**	951	[553]	[58]

*Includes production from alcohol fuel plants.
**Includes production from natural gas plants.
Sources: U.S. Department of Energy, Energy Information Administration. 1981.
Montana Department of Revenue. 1981.

PRODUCT MARKETING

Whereas the six refineries produce most of the petroleum fuels consumed in Montana, twenty-four oil companies market fuel in the state. Most of these marketing companies do not bring their own fuel directly into Montana for resale. Instead, the oil companies rely on exchange agreements to minimize transportation costs.

Montana fuel imports and refinery production can be considered a pool from which the marketing companies draw their supplies. Because petroleum products are exchanged between companies at the refinery and throughout the distribution system, the additives that distinguish one company's product from another's are not added until the fuel reaches the wholesale or retail market.

Companies market their fuel to three customer classes: wholesale distributors or jobbers; retail service station dealers; and large commercial or industrial accounts. In addition, companies often sell fuel to each other as well as to fuel brokers through ongoing contracts or one time spot market sales.

Jobbers supply fuel to bulk purchasers, to retail stations and truck stops that do not purchase fuel directly from an oil company, and to other jobbers. Customers who buy in bulk from a jobber include agricultural, commercial, and industrial accounts, government agencies, and residential heating oil accounts. Dealers operate retail service stations and truck stops. The large fuel-consuming industries, such as railroads and mining companies, often purchase fuel directly from an oil company, eliminating the jobber.

PRODUCT INVENTORIES

To accommodate seasonal variation in petroleum product demand and to provide flexibility in meeting customer requirements, refiners and pipelines maintain large volume fuel storage facilities. Management of these inventories is based on supply conditions relative to anticipated demand schedules. Financial considerations also determine inventory management: interest rates affect carrying costs, tax liability can be affected by various management alternatives, and profits will be adjusted by any significant change in the future market value of the inventories.

Because of reduced demand, high interest charges, and declining world oil prices, national inventories of petroleum products are being maintained at substantially lower levels than in previous years. The Department of Energy's data on end-of-month fuel inventories in Montana indicate that the state's refiners and pipeline terminal operators have followed the national pattern of stock management.[43,44]

Monthly trends in motor gasoline stocks, depicted in Figure 12, suggest that Montana's refiners typically build inventories during the winter, from November through March, then draw down supplies during the spring and summer driving season to reach minimum levels by September or October. Following the national trend, refiners modified their stock building operations in 1981. Instead of adding to gasoline inventories during the first quarter, refiners began stock withdrawals in January. With some month to month fluctuation, the drawdown continued through September. As a result of this shift, motor gasoline inventories at the refinery were maintained at half the average historic level during 1981. While a small reduction in bulk terminal stocks also occurred in 1981, these inventories are generally comparable to historic volumes.

By comparison, the average volume of distillate fuel oil (including kerosene) in primary storage declined substantially during the period from 1974 through 1978, but has remained fairly stable over the past several years. Monthly variations in stock levels, shown in Figure 13, indicate no consistent pattern of seasonal build-up and drawdown of inventories.

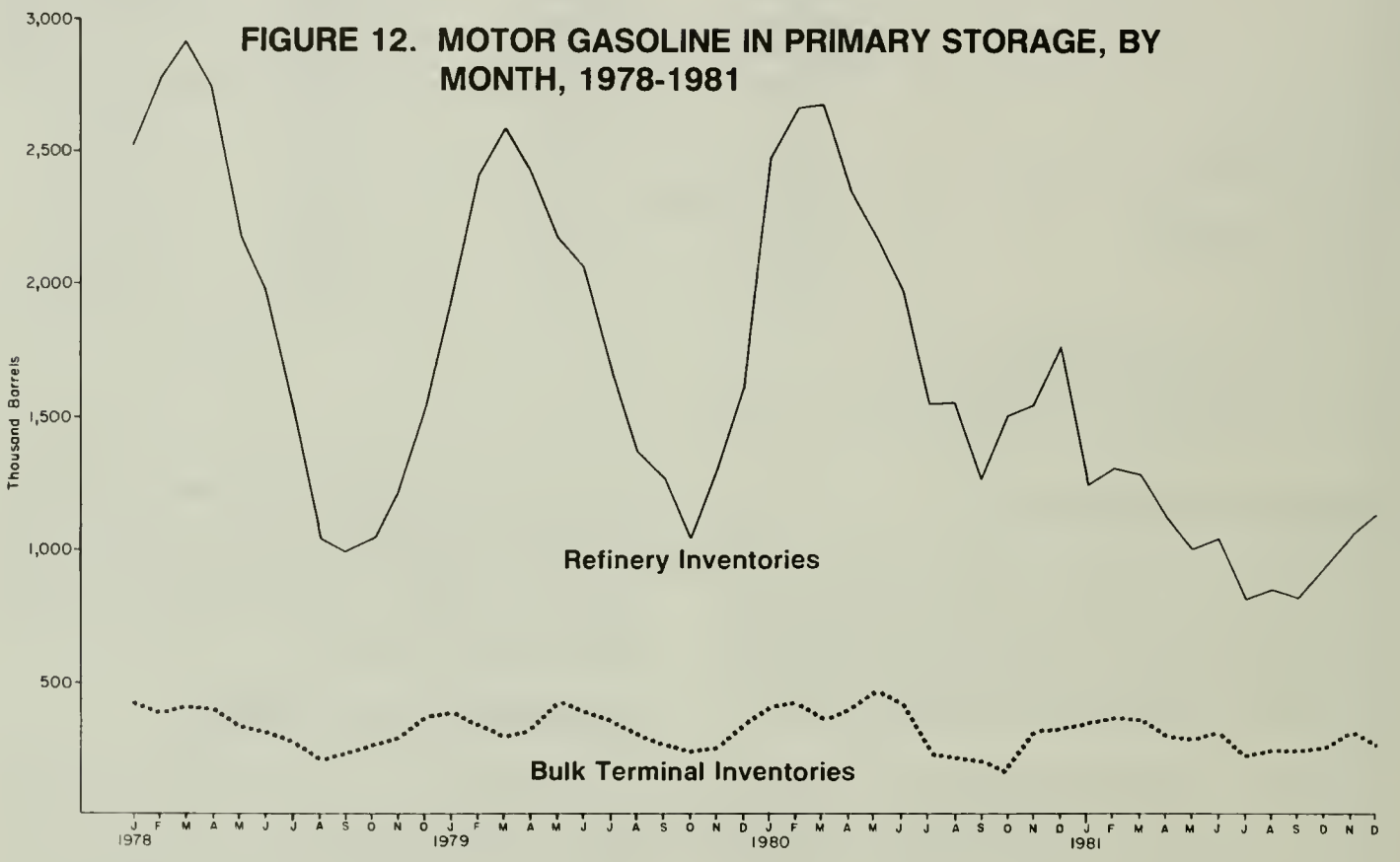


FIGURE 12. MOTOR GASOLINE IN PRIMARY STORAGE, BY MONTH, 1978-1981

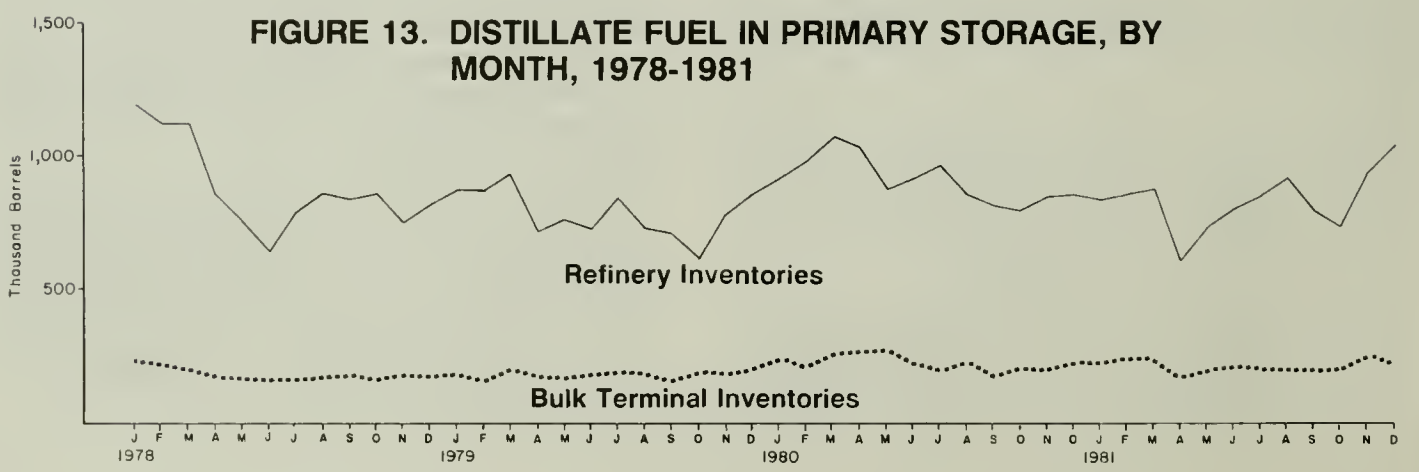


FIGURE 13. DISTILLATE FUEL IN PRIMARY STORAGE, BY MONTH, 1978-1981

FUEL SUPPLY AND CONSUMPTION

Oil companies that make the first sale of a petroleum product into the state's fuel distribution system are called "prime suppliers" by the Department of Energy and "licensed distributors" by the Montana Department of Revenue's Motor Fuel Tax Division. Prime suppliers and licensed distributors report monthly sales data to state and federal agencies. Because the tax reports[34] identify sales volumes that are ultimately exported whereas prime suppliers do not track secondary sales,[35] the tax data are considered a more accurate measure of instate fuel consumption. However, only motor gasoline, aviation fuels, and on-highway use of diesel fuel are subject to a volumetric tax; propane, kerosene, heating oil, off-road diesel, and residual fuel are exempt.

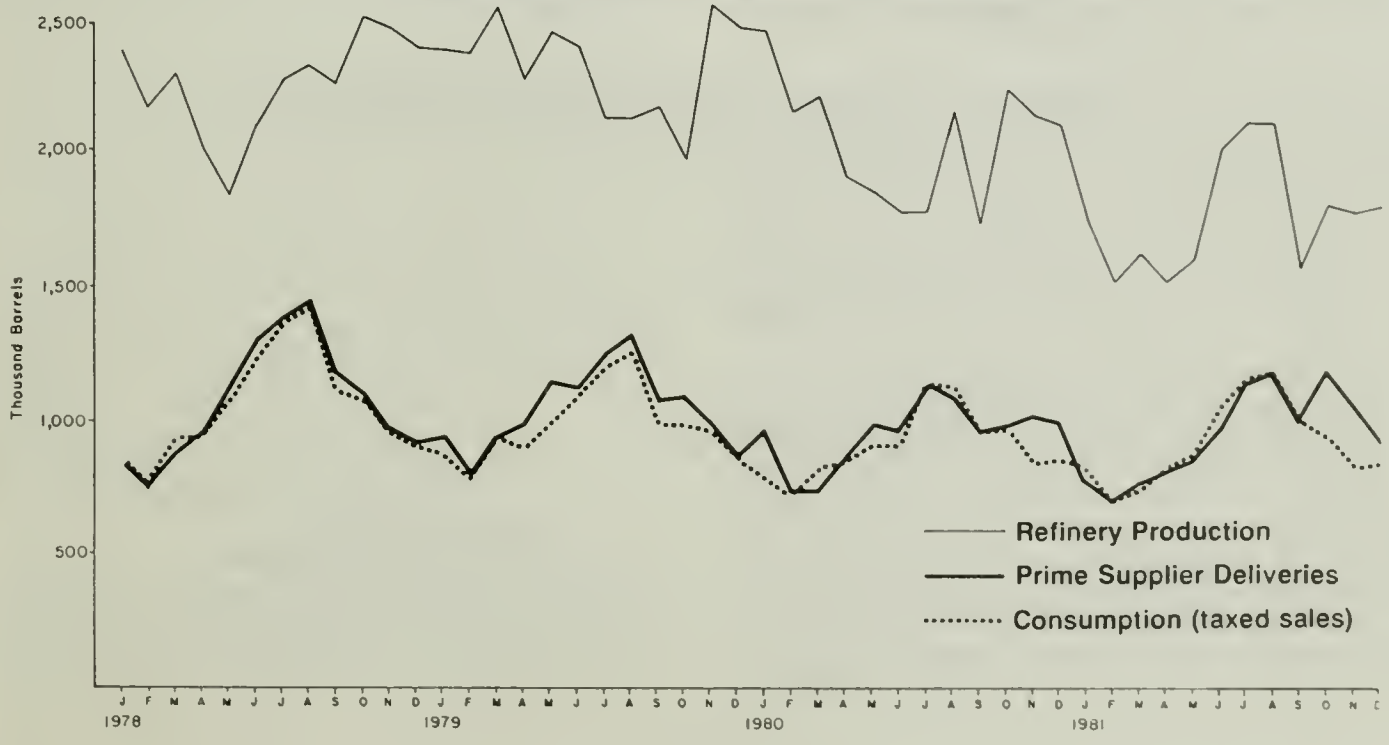
To supplement state tax data, the DOE publishes sales statistics for the liquified petroleum gases, including propane, and delivery data for the distillate fuels and residual fuel oil.[33] Based on surveys of fuel suppliers and distributors, in the past these data were not considered to be very reliable, because of the small sample size for Montana and the fact that the figures did not correspond to the supply data. In an effort to improve the accuracy of its statistics, the DOE revised its sampling methodology during 1980 and 1981. As a result, the 1981 data more closely approximate the prime supplier data and provide valuable information on end-use consumption.

Motor Gasoline

Monthly gasoline supplies to Montana are compared with taxable volumes and refinery production in Figure 14. This graph shows that, while production trends are variable, gasoline supplies and sales exhibit a strong pattern of seasonal growth and decline, corresponding to changes in weather and travel-related fuel demand. Gasoline consumption, as measured by the tax data, falls to a minimum level in late winter, climbs steadily through the spring, peaks in late summer, then gradually decreases in the fall and winter. The monthly variation between prime supplier deliveries and taxed volumes in 1979 and in the fall of 1980 and 1981 suggests that a portion of the gasoline initially delivered to Montana distributors was ultimately sold out of state.

Gasoline consumption trends indicate that Montana's annual gasoline requirements grew by 35 percent during the period from 1970 to 1978. Despite this cumulative increase, year-to-year trends are irregular in that gasoline consumption fell by 3.4 percent in 1974 as a result of the Arab oil embargo and the associated escalation of fuel prices. By comparison, the 1979 oil supply disruption and subsequent price spiral caused a sharper and more sustained reduction in Montana's gasoline use. Annual consumption, which dropped by 6 percent in 1979, continued to decline in 1980 for an overall reduction of 13.5 percent in the state's gasoline requirements in just two years. The moderation of petroleum product prices in 1981 because of the world-wide oil glut, stimulated a marginal .2 percent growth in Montana's gasoline consumption in 1981.

FIGURE 14. MOTOR GASOLINE PRODUCTION, SUPPLY, AND CONSUMPTION, BY MONTH, 1978-1981



Gasohol

Gasohol, a mixture of 90 percent motor gasoline and 10 percent alcohol, accounted for .1 percent of Montana's gasoline sales in 1981.[34] Although small, the sales volume of nearly 475 thousand gallons is triple 1980 gasohol consumption. Since commercial marketing of Montana-produced alcohol began in the last quarter of 1981, the fuel mixture is now more widely available and gasohol sales have escalated in 1982.

Alcotech, located in Ringling, south of White Sulphur Springs, is the state's largest facility with an annual productive capacity of 1.5 million gallons. A smaller commercial plant, A.E. Montana, operating in Amsterdam, northwest of Bozeman, is capable of producing 600 thousand gallons of fuel-grade alcohol each year. In addition, several smaller facilities in Conrad, Geraldine, and Polson as well as on-farm operations contribute to the state's alcohol fuel production.

Distillate Fuel

The distillate fuels include kerosene, #1 and #2 heating oil (also called range, stove, or fuel oil), #1 and #2 diesel fuel, railroad diesel, and other middle distillates. Although the various categories of distillate have very specific definitions and quality specifications, production and supply statistics do not provide a detailed or consistent identification of the different products. Therefore, in order to compare monthly refinery production trends with prime supplier deliveries, as in Figure 15, the data for the distillate fuels are aggregated into a single category.

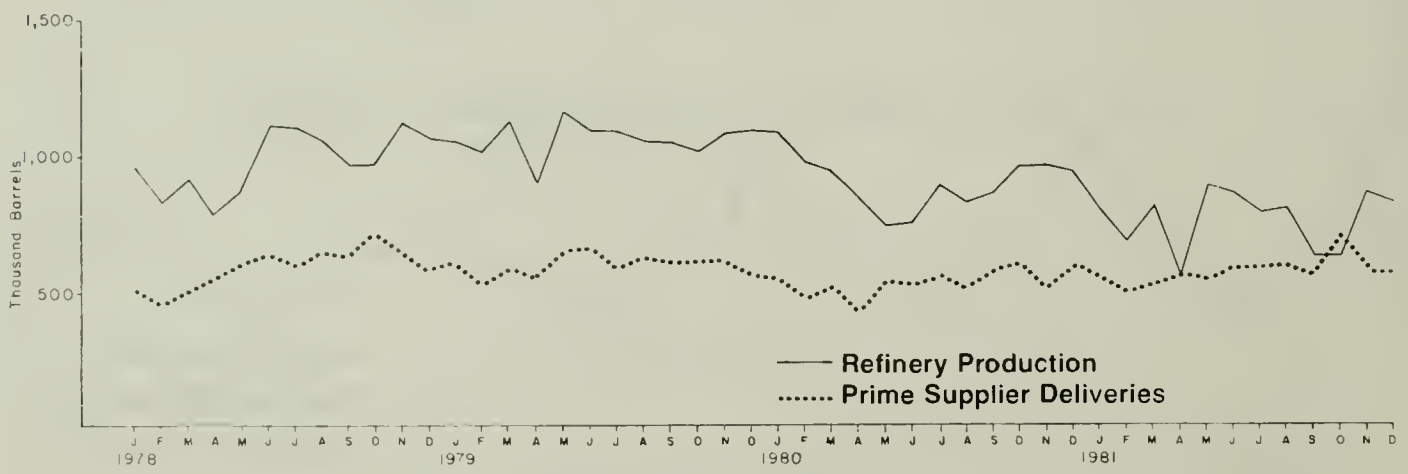
Aside from the production cutbacks in the spring and, to a lesser extent, in the fall for refinery maintenance or turnaround, the data show no consistent seasonal pattern in either the production or sale of distillate fuel during the period from 1978 to 1981. Although refinery output dropped below prime supplier deliveries in April and October of 1981, withdrawals from primary storage averted the possibility of a supply shortfall.

Annual refinery production of distillate fuel, which fell by 15 percent in 1980, continued to decline in 1981 to total a 28 percent reduction in output as compared to 1979. By comparison, the volume of distillate fuel sold to Montana distributors in 1981 was only 4 percent less than in 1979. Even though deliveries dropped by 11 percent in 1980, an apparent turnaround in demand prompted a 7 percent growth in the amount of distillate supplied in 1981.

Because the cutback in refinery production is much greater than the reduction in Montana's distillate fuel requirements, out-of-state exports are less than in previous years. Whereas refiners typically exported 45 to 50 percent of distillate production through the 1970s, they sold only 29 percent of 1981 output to neighboring states.

Of the 6.5 million barrels of distillate delivered to the state in 1981, Montanans consumed nearly 40 percent, 2.5 million barrels in on-highway diesel-powered transportation vehicles such as trucks and buses. Ranking second in distillate requirements with 1.5 million barrels, the railroads used almost a quarter of the state's total supply. Agricultural consumption of just under a million barrels accounted for 15 percent of distillate sales, whereas the residential, commercial, and industrial sectors and the oil industry, itself, each purchased about 5 percent of the volume sold. Other users, including construction companies, loggers, utilities, and the military, consumed the balance of the distillate fuel marketed in Montana.

FIGURE 15. DISTILLATE FUEL PRODUCTION AND SUPPLY, BY MONTH, 1978-1981



Aviation Fuels

Montana's refiners produce three types of aviation fuels: aviation gasoline, a high-octane fuel used in piston-engined aircraft; and naptha and kerosene-based jet fuels for combustion in turbine-engined jets.

Compared to the 3.1 million barrels of jet fuel produced by the state's refiners in 1981, Montana's taxable sales were 674 thousand barrels, just over 20 percent of total jet fuel supply. In contrast, aviation gasoline output of 99 thousand barrels fell short of meeting instate requirements of approximately 160 thousand barrels. As a result, out-of-state refiners supplied about 40 percent of the aviation gasoline marketed in Montana in 1981.

Annual sales of aviation gasoline and jet fuel have followed markedly different trends over the past several years. Aviation gasoline sales increased steadily from 1976 to 1979 for a 30 percent cumulative growth during this period. Despite a sharp drop in consumption in 1980, sales recovered in 1981 to generate an overall expansion in aviation gasoline use between 1979 and 1981.

In contrast to the 36 percent increase in Montana's aviation gasoline consumption since 1976, the state cut back its jet fuel requirements by 7 percent during the same period. The overall reduction in jet fuel sales has been fairly erratic, however, since the year-to-year decline was temporarily reversed by a 25 percent jump in deliveries in 1979.

IV. Government Regulation of the Oil Market

The U.S. oil industry has a long history of government regulation, one that has shifted from managing excess production to managing supply shortages. The government's role in energy emergencies, particularly oil supply disruptions, was a controversial policy issue in 1981 following President Reagan's deregulation of the oil industry and the expiration of the Emergency Petroleum Allocation Act. Denying the need for allocation authority, President Reagan vetoed the Standby Petroleum Allocation Act of 1982, but later in the year signed a substitute bill, the Energy Emergency Preparedness Act.

The current administration's intention to let market forces prevail during oil shortages[45] may amplify fuel supply problems for rural states, like Montana, that have markets characterized by low volume sales and high transportation costs. Furthermore, a laissez-faire policy at the federal level will place primary responsibility on state governments to protect the public health and minimize the economic consequences of the shortage.

This section provides an overview of the federal regulatory structure created by the Emergency Petroleum Allocation Act, which dominated the domestic oil market from 1973 to 1981; the Emergency Energy Conservation Act of 1979; and the Energy Emergency Preparedness Act of 1982. The State's authority to respond to fuel shortages provided by the Energy Supply Emergency Powers Act is also discussed.

EMERGENCY PETROLEUM ALLOCATION ACT OF 1973

In the fall of 1973, the Arab oil embargo caught the United States unprepared for a shortfall in transportation and heating fuels. Congress reacted by passing the Emergency Petroleum Allocation Act (EPAA)(Public Law 93-159) to manage supplies and to control rising prices. As amended by the Energy Policy and Conservation Act in 1975, the EPAA established a complex and extensive regulatory structure over the domestic oil industry.

The oil price and allocation controls covered virtually all aspects of the oil market—from production to refining and marketing. By freezing supplier-purchaser relationships, the allocation controls required oil producers and refiners to continue to supply their historical customers on a proportionate basis unless otherwise authorized by the Federal Energy Administration (later the Department of Energy). Wellhead price controls prevented domestic oil prices from escalating to the cost of OPEC oil. Price controls on petroleum products set limits on the marketer's profits by restricting the seller's margin, the mark-up over the wholesale cost and taxes.

An entitlements program guaranteed all refiners an equal share of the price controlled domestic oil, whereas a buy-sell program required the largest integrated companies to resell oil supplies to crude-short refiners. To reduce the impacts of local supply problems, a state set-aside program authorized the state to allocate 3 to 5 percent of the petroleum products sold intrastate each month.

Providing the regulatory framework for governmental response to both the 1973-74 and 1979 oil supply disruptions, the EPAA did not mandate the specific regulations. Instead, it provided the President with discretionary authority to implement the various programs. Therefore, until President Reagan lifted all of the controls on January 28, 1981, the regulations were continually adjusted and modified through administrative rule-making. The EPAA, which provided the statutory authority for oil price and allocation controls, expired on September 30, 1981.

EMERGENCY ENERGY CONSERVATION ACT OF 1979

Following the petroleum fuel shortages in 1979, Congress enacted the Emergency Energy Conservation Act (EECA) (Public Law 96-102) to authorize the President to declare national energy emergencies and to establish national and state conservation targets for specific fuels. To provide a mechanism for responding to critical shortages, the law also requires the President to develop a gasoline rationing plan.

Shortly after taking office, Ronald Reagan suspended the implementation of the EECA by rescinding federal funds for state contingency planning. The administration also withdrew most of the proposed rules for implementing the law and repudiated the need for a rationing plan.

ENERGY EMERGENCY PREPAREDNESS ACT OF 1982

The expiration of the EPAA and the current administration's free market approach to fuel shortages provoked Congressional concern that the United States was not prepared to respond to another oil embargo or market disruption. Wanting the President to have at least the statutory authority to manage a critical fuel shortage, Congress passed the Standby Petroleum Allocation Act in 1982. President Reagan vetoed the bill to demonstrate his commitment to market allocation of fuel supplies even during a severe shortfall.

Although Congress upheld the veto, it reiterated the need for federal emergency planning and response capability by enacting the Energy Emergency Preparedness Act (EEPA) (Public Law 97-229). This law, signed by the President on August 3, 1982, establishes minimum fill rates for the Strategic Petroleum Reserve and requires the administration to submit several reports to Congress on federal contingency measures. In these reports, the President will outline his emergency powers and describe his plans and optional procedures for responding to a fuel supply crisis.

ENERGY SUPPLY EMERGENCY POWERS ACT

In the absence of coordinated federal action, the states may be required to minimize the impacts of a fuel shortage within their own jurisdictions. Following the example of other states, the Montana Legislature has empowered the Governor to respond to energy emergencies by managing supplies and reducing consumer demand through conservation programs.

The Energy Supply Emergency Powers Act, adopted in 1977, defines the Governor's authority during an energy shortage by specifying two stages of executive action corresponding to the degree of shortfall. In the first stage, an energy supply alert, the Governor may direct state and local agencies to reduce consumption and request the private sector to observe voluntary conservation measures. During the second phase, an energy emergency, the Governor may implement mandatory allocation, production, curtailment, and conservation programs in both the public and private sectors.

Recognizing that reliable information is essential for effective emergency response, the law provides the Governor with broad data collection authority. In amendments to the Act, the 1981 Legislature clarified this authority by specifying that the Governor may monitor energy supply and demand on an ongoing basis. Because of the inadequacy of state-specific data during the 1979 diesel fuel shortage, the amendments emphasize the development of a petroleum products data base.

Following public review and opportunity for comment, the Governor adopted administrative rules for responding to petroleum fuel and electricity shortages and for collecting petroleum products data from the oil industry. The Montana Energy Emergency Contingency Plan, published in 1981, provides a detailed framework for implementing the emergency rules. In addition, the Department of Natural Resources and Conservation's Energy Division has developed a petroleum monitoring capability to provide information and analysis for informed decision making.

This analytical report is a product of the Department's monitoring efforts. It is intended to present an overview of the structure and operations of Montana's oil and gas industry as well as a review of recent trends in production, supply and consumption.

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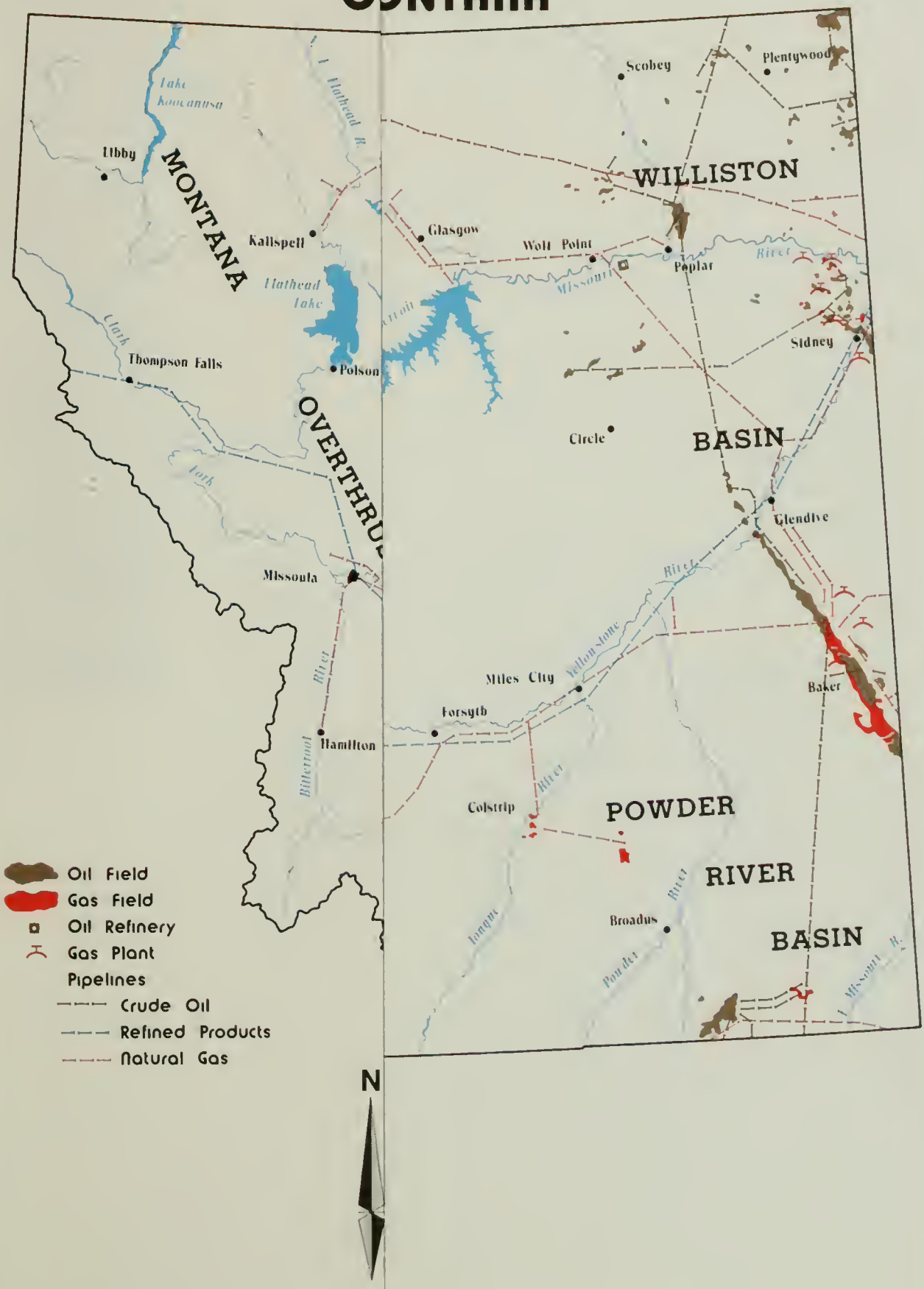
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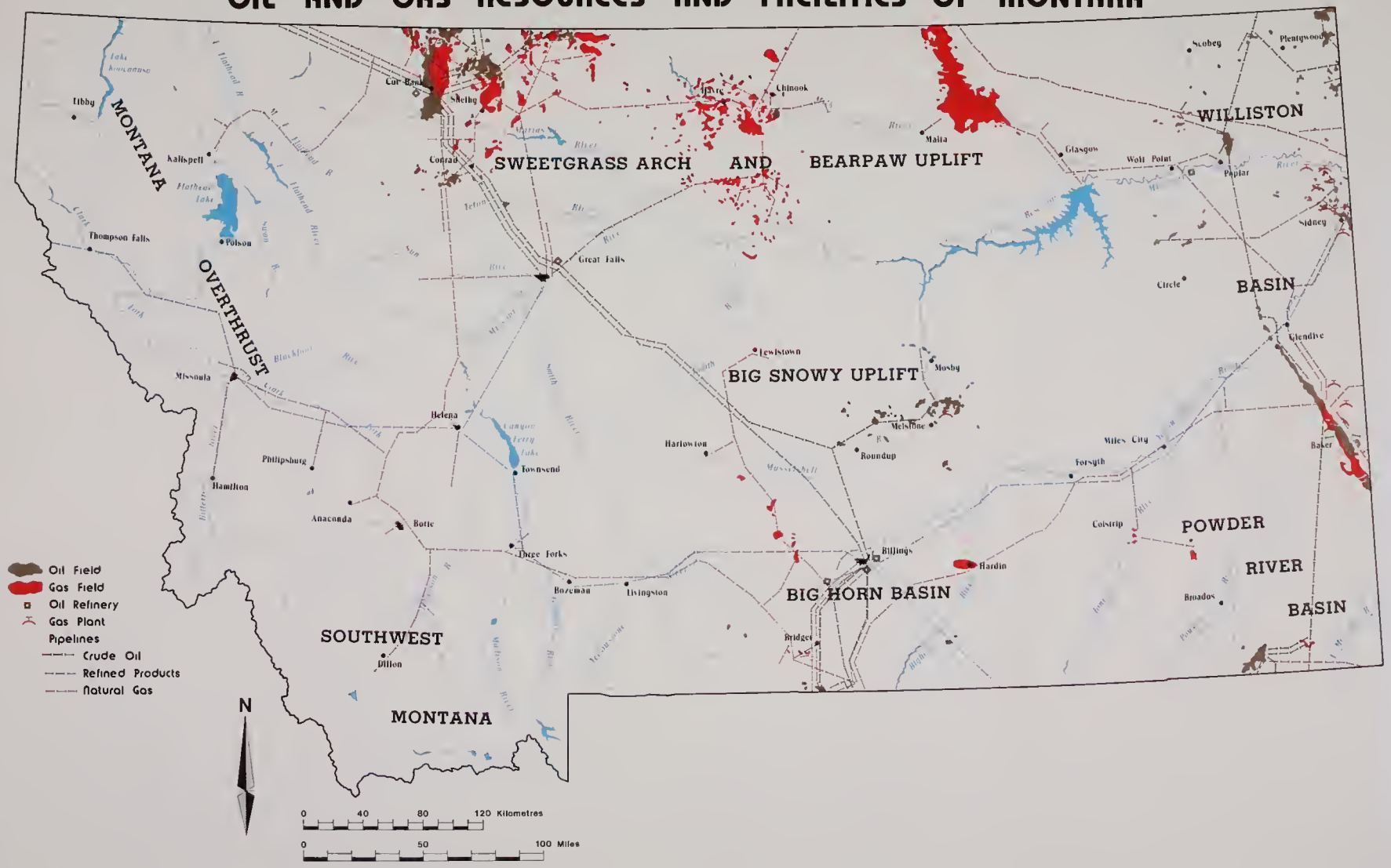

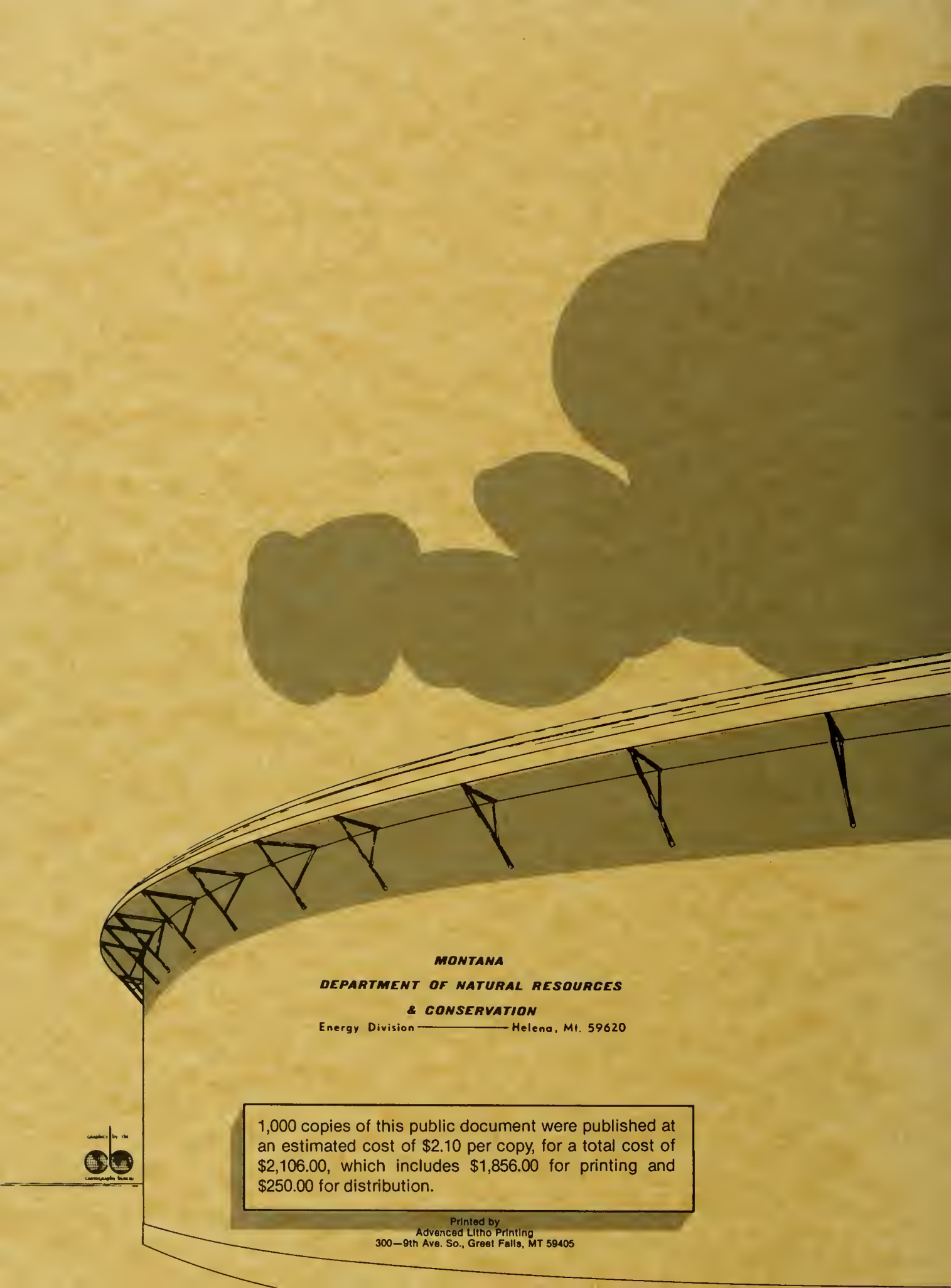

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